

US011970086B2

(12) **United States Patent**
Andrews et al.

(10) **Patent No.:** **US 11,970,086 B2**
(45) **Date of Patent:** ***Apr. 30, 2024**

(54) **VISIBILITY ENHANCEMENTS FOR DELIVERY VEHICLE**

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(73) Assignee: **Oshkosh Corporation**, Oshkosh, WI (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.
This patent is subject to a terminal disclaimer.

(21) Appl. No.: **18/116,038**

(22) Filed: **Mar. 1, 2023**

(65) **Prior Publication Data**
US 2023/0202350 A1 Jun. 29, 2023

Related U.S. Application Data
(63) Continuation of application No. 17/369,160, filed on Jul. 7, 2021, now Pat. No. 11,628,748.
(Continued)

(51) **Int. Cl.**
B60N 2/68 (2006.01)
B60N 2/015 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **B60N 2/01508** (2013.01); **B60N 2/06** (2013.01); **B60P 3/007** (2013.01); **B60R 7/08** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC **B60N 2/01508**; **B60N 2/00**; **B60N 2/06**; **B60N 2/688**; **B60J 1/08**; **B60J 1/10**;
(Continued)

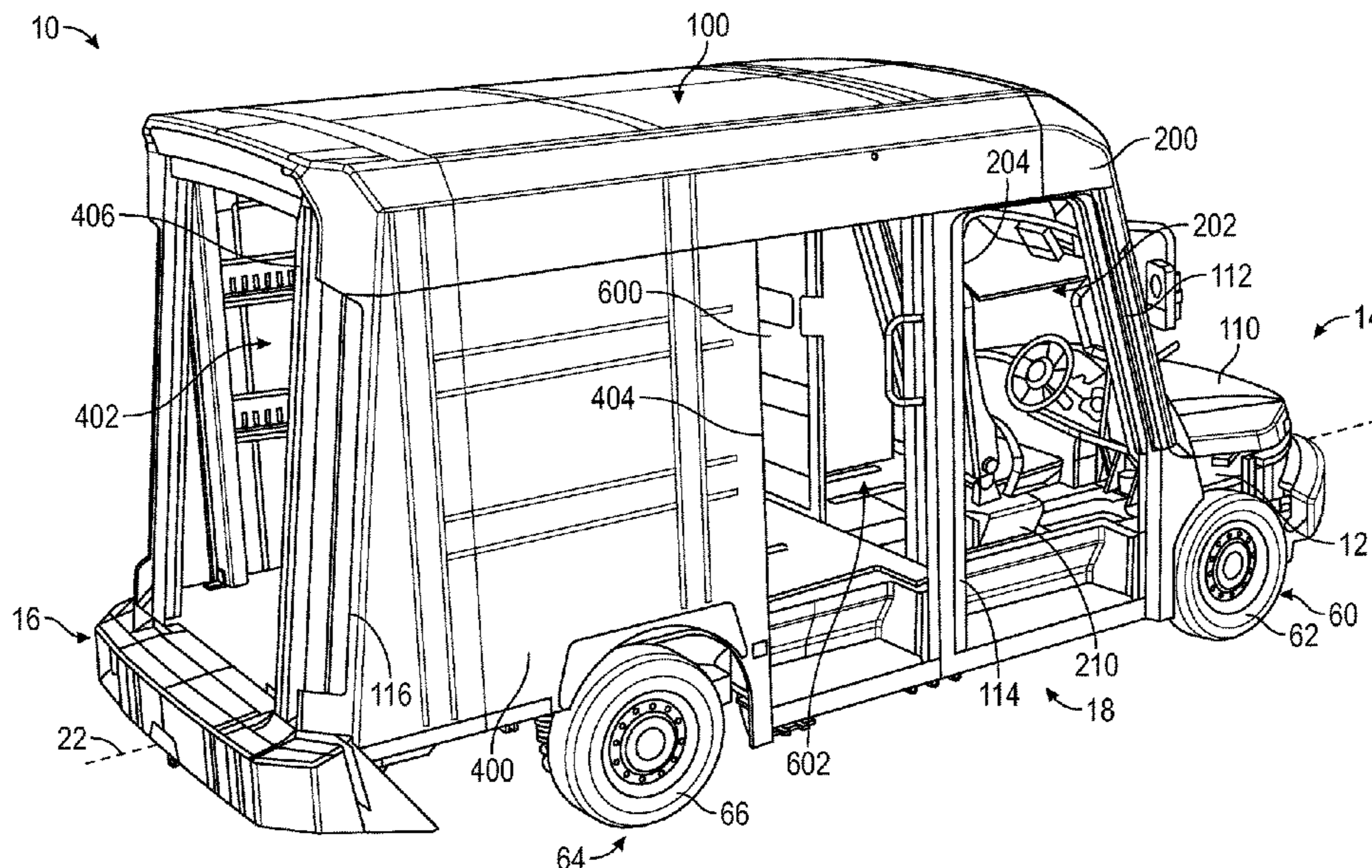
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Primary Examiner — Pinel E Romain
(74) *Attorney, Agent, or Firm* — Foley & Lardner LLP

(57) **ABSTRACT**
A vehicle assembly includes a vehicle body and a driver seat. The vehicle body defines a driver compartment having a first door with a first window and a second door with a second window. The driver seat is disposed within the driver compartment. When the driver seat is in a position that accommodates an operator being in a 95th male height percentile, the operator within the driver seat can see out of (i) the first window at a first angle relative to a forward looking direction that is parallel with a longitudinal axis of the vehicle body and (ii) the second window at a second angle relative to the forward looking direction. Each of the first angle and the second angle is at least 95 degrees.

20 Claims, 68 Drawing Sheets



Related U.S. Application Data

<p>(60) Provisional application No. 63/049,438, filed on Jul. 8, 2020, provisional application No. 63/049,456, filed on Jul. 8, 2020, provisional application No. 63/049,444, filed on Jul. 8, 2020, provisional application No. 63/049,377, filed on Jul. 8, 2020, provisional application No. 63/049,374, filed on Jul. 8, 2020, provisional application No. 63/049,446, filed on Jul. 8, 2020.</p>	<p>5,741,000 A 4/1998 Goodbred 5,779,300 A 7/1998 McNeilus et al. 5,819,569 A 10/1998 Herdman 5,829,946 A 11/1998 McNeilus et al. 5,931,628 A 8/1999 Christenson 6,149,290 A 11/2000 Quigley 6,234,565 B1 5/2001 Bryant et al. 6,290,450 B1 9/2001 Humphries et al. 6,370,824 B1 4/2002 Keeney et al. 6,485,079 B1 11/2002 Brown et al. 6,527,495 B2 3/2003 Humphries et al. 6,666,491 B2 12/2003 Schrafel 6,883,671 B2 4/2005 Rushing 6,889,534 B2 5/2005 Koluch 6,918,721 B2 7/2005 Venton-Walters et al. 6,938,749 B1 9/2005 Quigley et al. 6,997,506 B2 2/2006 Hecker 7,055,880 B2 6/2006 Archer 7,073,847 B2 7/2006 Morrow et al. 7,118,314 B2 10/2006 Zhou et al. 7,264,305 B2 9/2007 Kuriakose 7,370,904 B2 5/2008 Wood et al. 7,517,005 B2 4/2009 Kuriakose 7,621,580 B2 11/2009 Randjelovic et al. 7,641,269 B2* 1/2010 Matsumoto B62D 25/04 296/193.06</p>	<p>(51) Int. Cl. <i>B60N 2/06</i> (2006.01) <i>B60P 3/00</i> (2006.01) <i>B60R 7/08</i> (2006.01) <i>E05B 81/14</i> (2014.01) <i>E05B 83/40</i> (2014.01) <i>B60J 1/08</i> (2006.01) <i>B60J 1/10</i> (2006.01) <i>B60J 1/12</i> (2006.01) <i>B60J 5/04</i> (2006.01) <i>B60J 10/70</i> (2016.01) <i>B60N 2/00</i> (2006.01) <i>B60P 7/08</i> (2006.01) <i>B60P 7/15</i> (2006.01) <i>B62D 1/16</i> (2006.01) <i>B62D 21/02</i> (2006.01) <i>B62D 25/04</i> (2006.01) <i>B62D 25/08</i> (2006.01) <i>B62D 25/10</i> (2006.01) <i>B62D 33/06</i> (2006.01) <i>E05B 79/04</i> (2014.01)</p>	<p>(52) U.S. Cl. CPC <i>E05B 81/14</i> (2013.01); <i>E05B 83/40</i> (2013.01); <i>B60J 1/08</i> (2013.01); <i>B60J 1/10</i> (2013.01); <i>B60J 1/12</i> (2013.01); <i>B60J 5/04</i> (2013.01); <i>B60J 5/0401</i> (2013.01); <i>B60J 10/70</i> (2016.02); <i>B60N 2/00</i> (2013.01); <i>B60N 2/688</i> (2013.01); <i>B60P 7/0815</i> (2013.01); <i>B60P 7/15</i> (2013.01); <i>B62D 1/16</i> (2013.01); <i>B62D 21/02</i> (2013.01); <i>B62D 25/04</i> (2013.01); <i>B62D 25/082</i> (2013.01); <i>B62D 25/10</i> (2013.01); <i>B62D 33/06</i> (2013.01); <i>E05B 79/04</i> (2013.01)</p>	<p>(58) Field of Classification Search CPC B60J 1/12; B60J 5/04; B60J 5/0401; B60J 10/70; B60P 3/007; B60P 7/0815; B60P 7/15; B60R 7/08; B62D 1/16; B62D 21/02; B62D 25/04; B62D 25/082; B62D 25/10; B62D 33/06; E05B 79/04; E05B 81/14; E05B 83/40 USPC 296/190.1 See application file for complete search history.</p>	<p>9,366,507 B1 6/2016 Richmond et al. 9,404,430 B2 8/2016 Krishnan 9,493,093 B2 11/2016 Stingle et al. 9,656,640 B1 5/2017 Verhoff et al. 9,707,869 B1 7/2017 Messina et al. 9,738,186 B2 8/2017 Krueger et al. 9,802,655 B2 10/2017 Sharbono et al. 10,309,132 B1 6/2019 Johnson et al. 10,545,010 B1 1/2020 Leeman et al. 10,611,416 B1 4/2020 Groteleuschen et al. D907,544 S 1/2021 Wall et al. 11,225,185 B1 1/2022 McGraw et al. 11,225,816 B2 1/2022 Gayhart 11,440,456 B1 9/2022 Willison et al. 11,485,201 B2 11/2022 Singh et al. 2003/0226737 A1 12/2003 Quigley et al. 2004/0135395 A1 7/2004 Pugh et al. 2005/0131600 A1 6/2005 Quigley et al. 2005/0156445 A1 7/2005 Mains 2005/0263337 A1 12/2005 Corey et al. 2006/0055206 A1 3/2006 Morrow et al. 2006/0091705 A1 5/2006 White et al. 2007/0189108 A1 8/2007 Lindblom et al. 2008/0004777 A1 1/2008 Quigley 2008/0059030 A1 3/2008 Quigley et al. 2008/0099213 A1 5/2008 Morrow et al. 2009/0160220 A1 6/2009 Elijah 2009/0293367 A1 12/2009 Gwak 2010/0264695 A1 10/2010 Hill et al. 2010/0283290 A1 11/2010 Akahane et al. 2011/0148134 A1 6/2011 Gerhardt et al. 2011/0289989 A1 12/2011 Reine et al. 2012/0235006 A1 9/2012 Sailer et al. 2012/0282077 A1 11/2012 Alberts et al. 2014/0054916 A1 2/2014 Knudtson et al. 2014/0059936 A1* 3/2014 Gielda B60J 10/24 49/394</p>	<p>(56) References Cited U.S. PATENT DOCUMENTS 3,451,499 A 6/1969 Taylor 3,641,707 A 2/1972 Kellos 3,808,742 A 5/1974 Ehret et al. 4,034,509 A 7/1977 DeRees 5,083,832 A 1/1992 Ohya 5,219,202 A 6/1993 Rink et al. 5,357,143 A 10/1994 Lehr et al. 5,493,881 A 2/1996 Harvey 5,503,700 A 4/1996 Dupuy 5,538,274 A 7/1996 Schmitz et al. 5,697,741 A 12/1997 Harris et al.</p>
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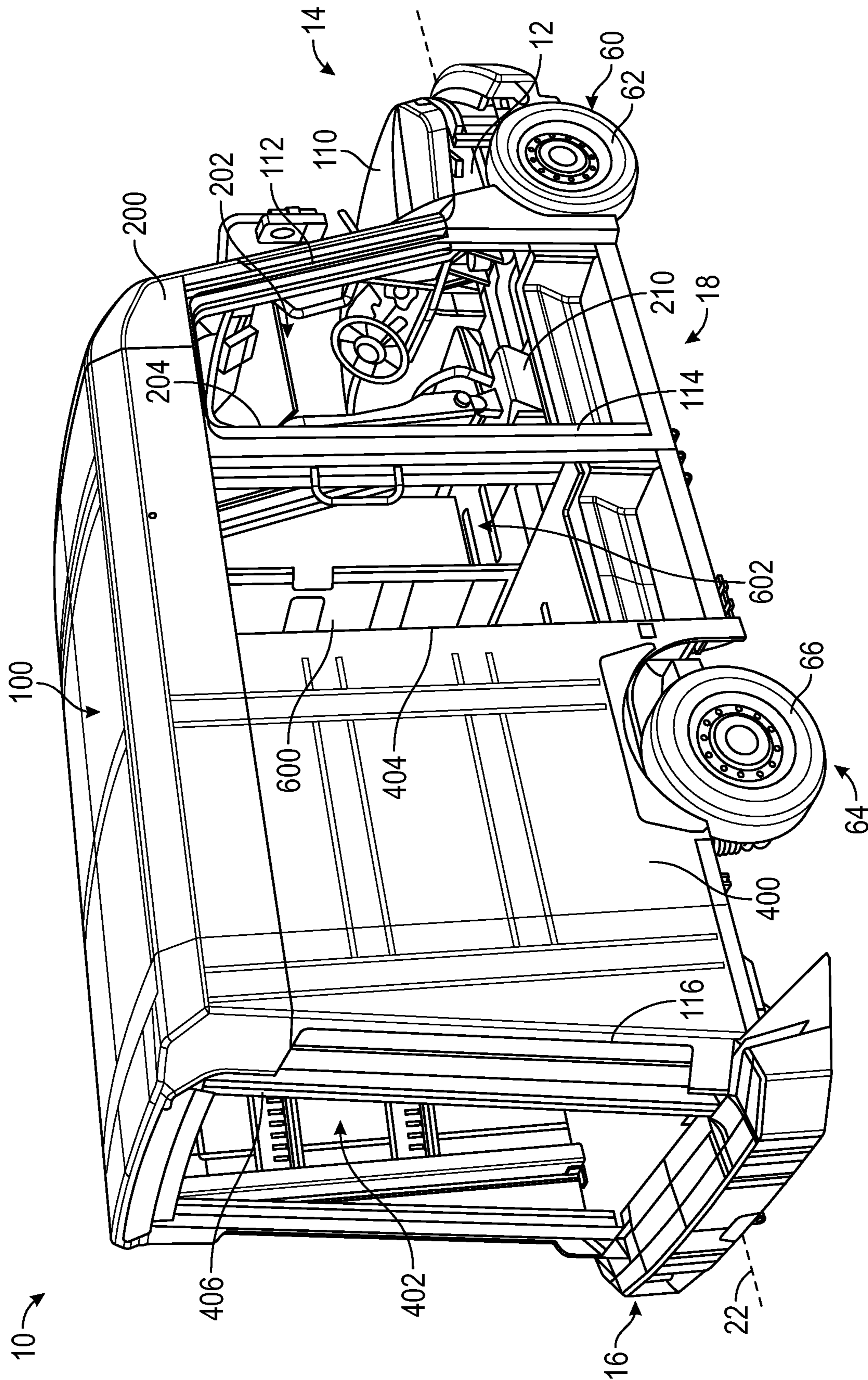


FIG. 1

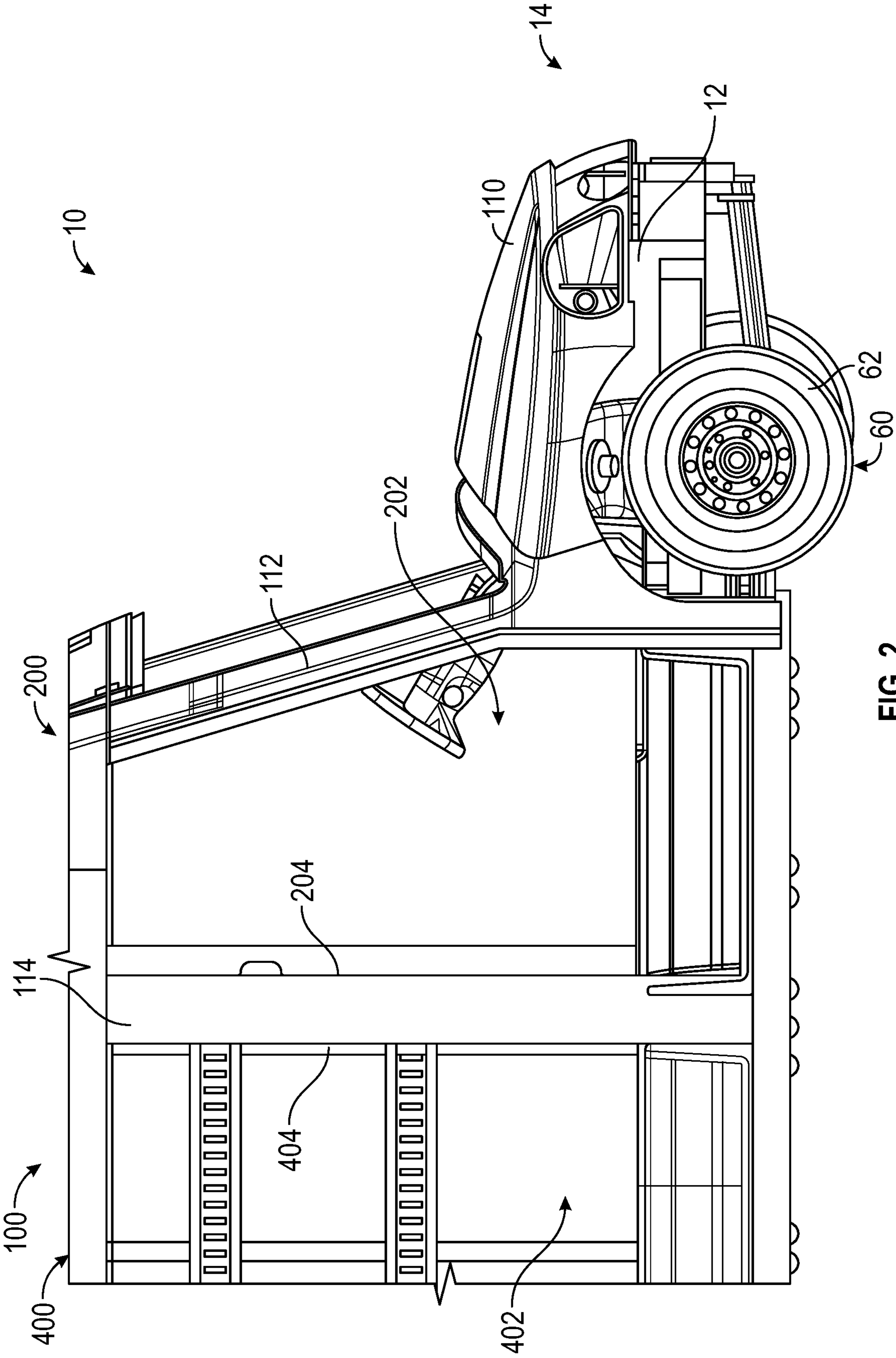


FIG. 2

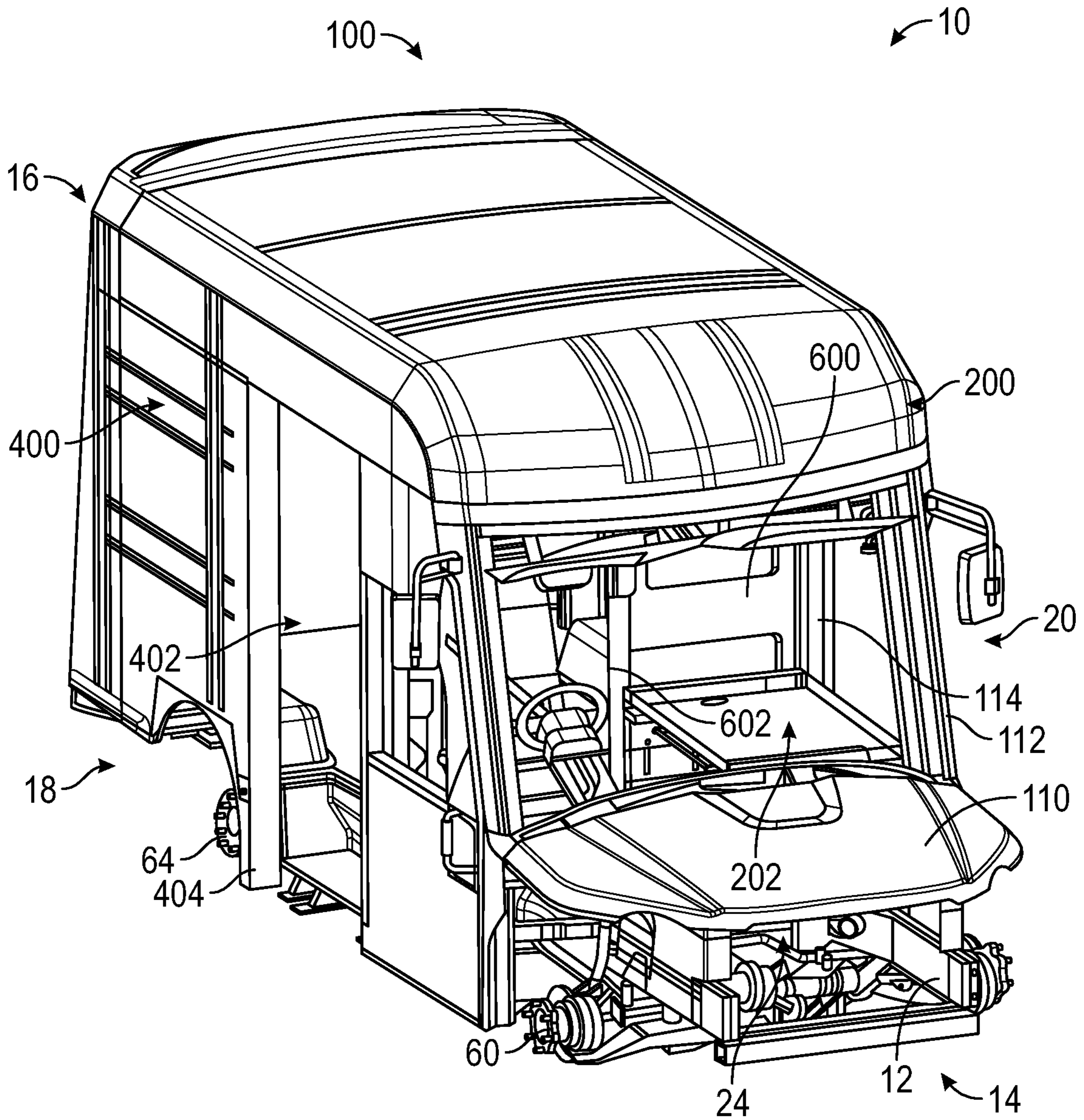


FIG. 3

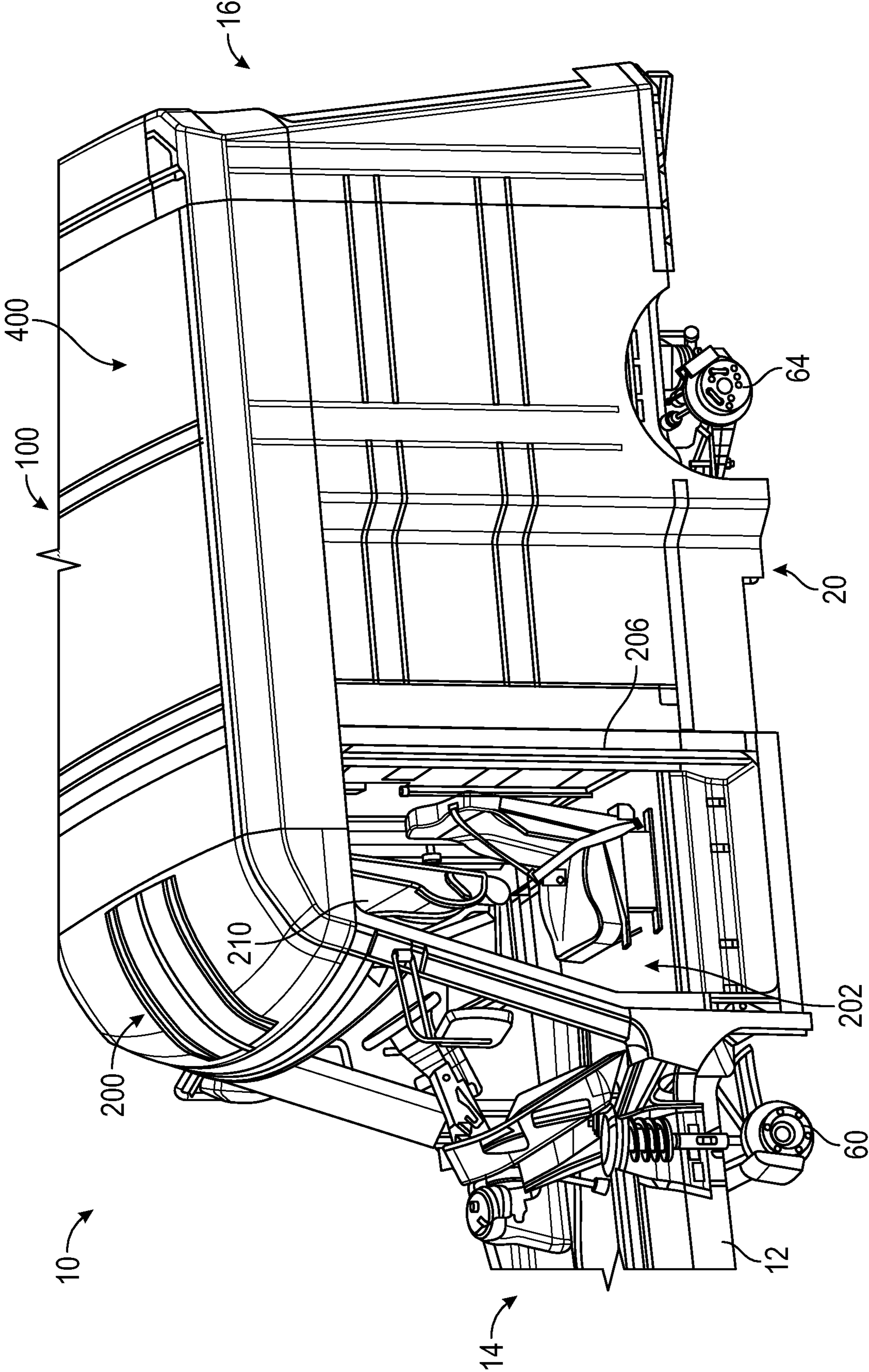


FIG. 4

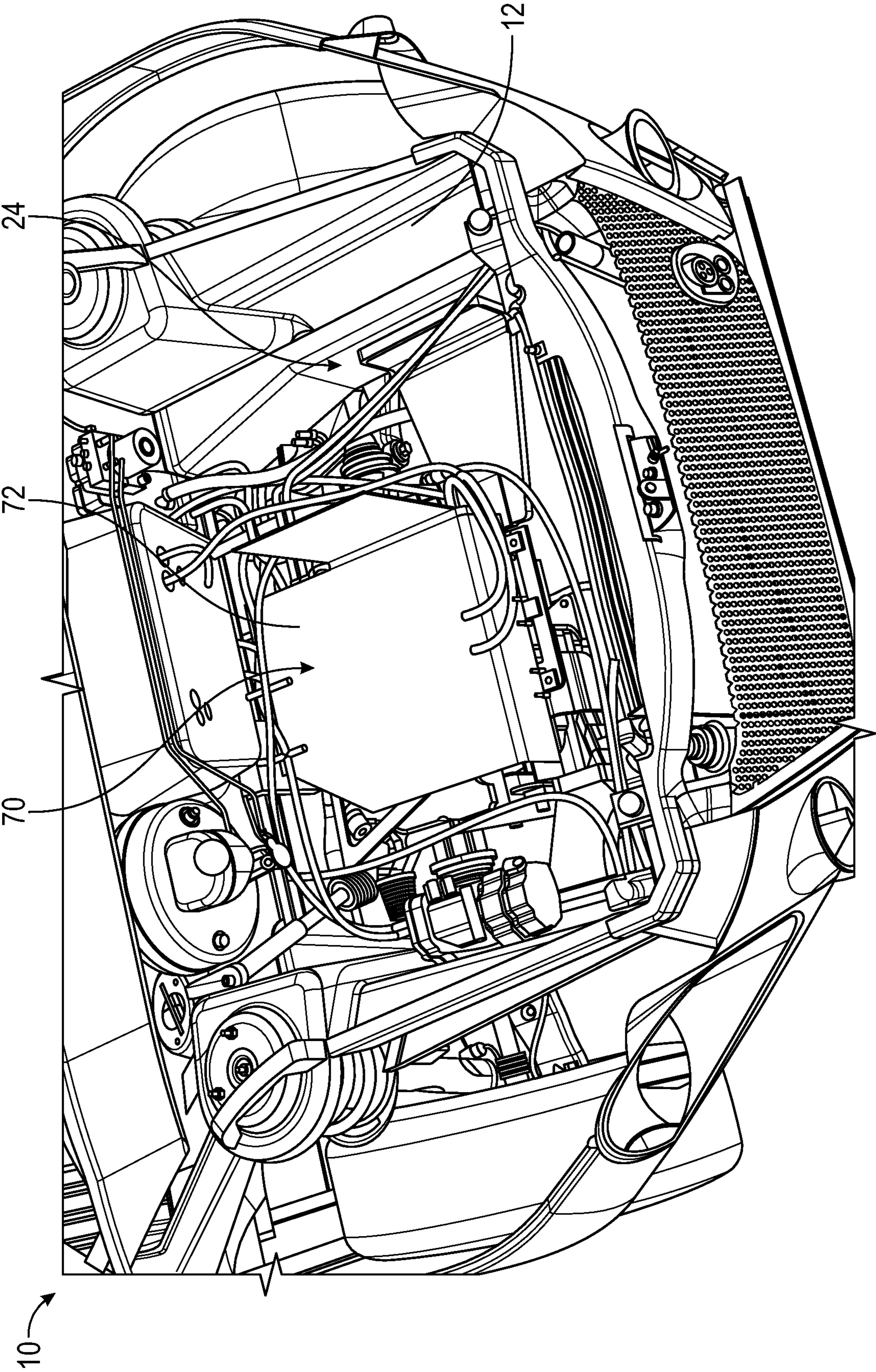


FIG. 5

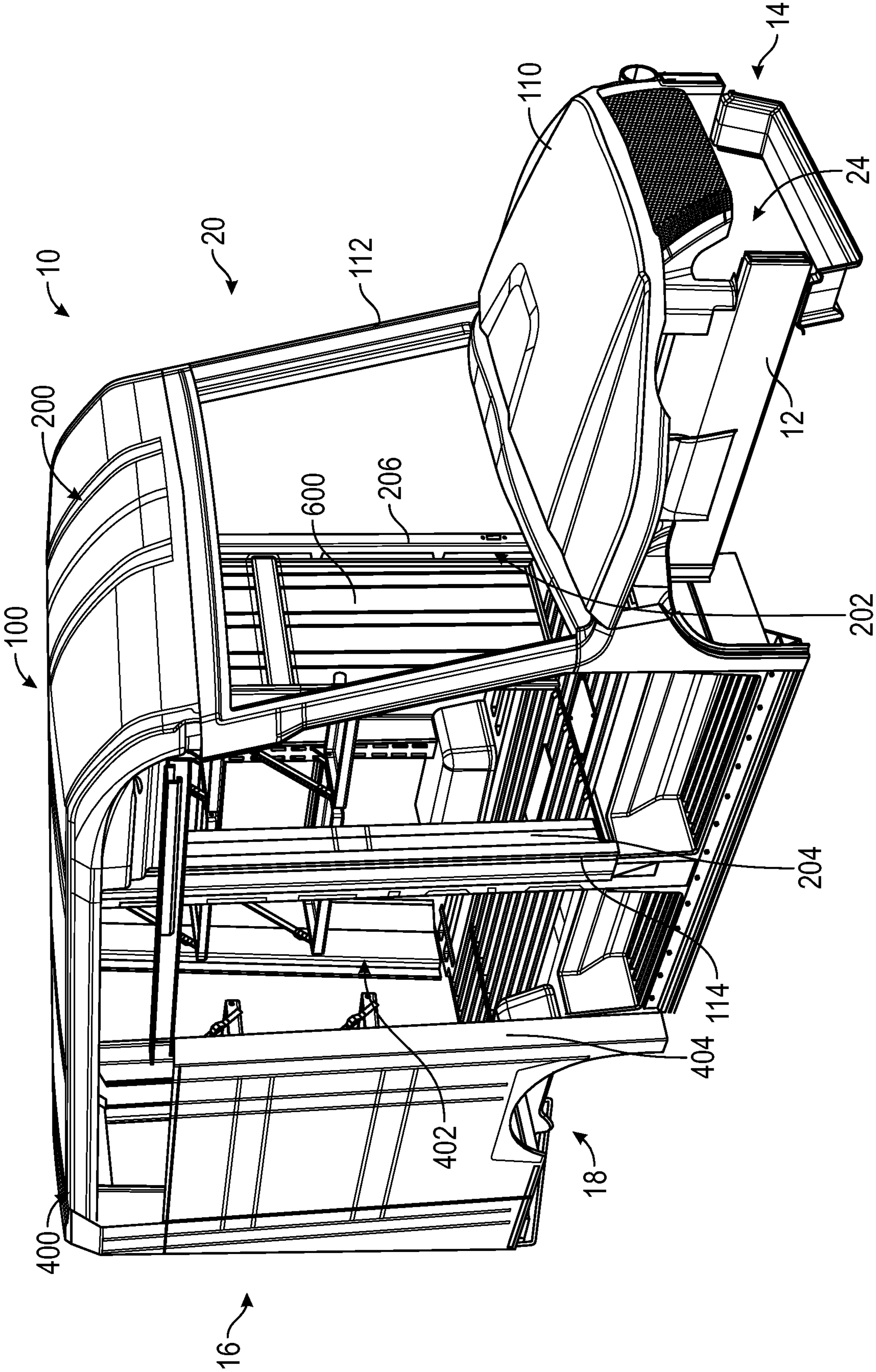


FIG. 6

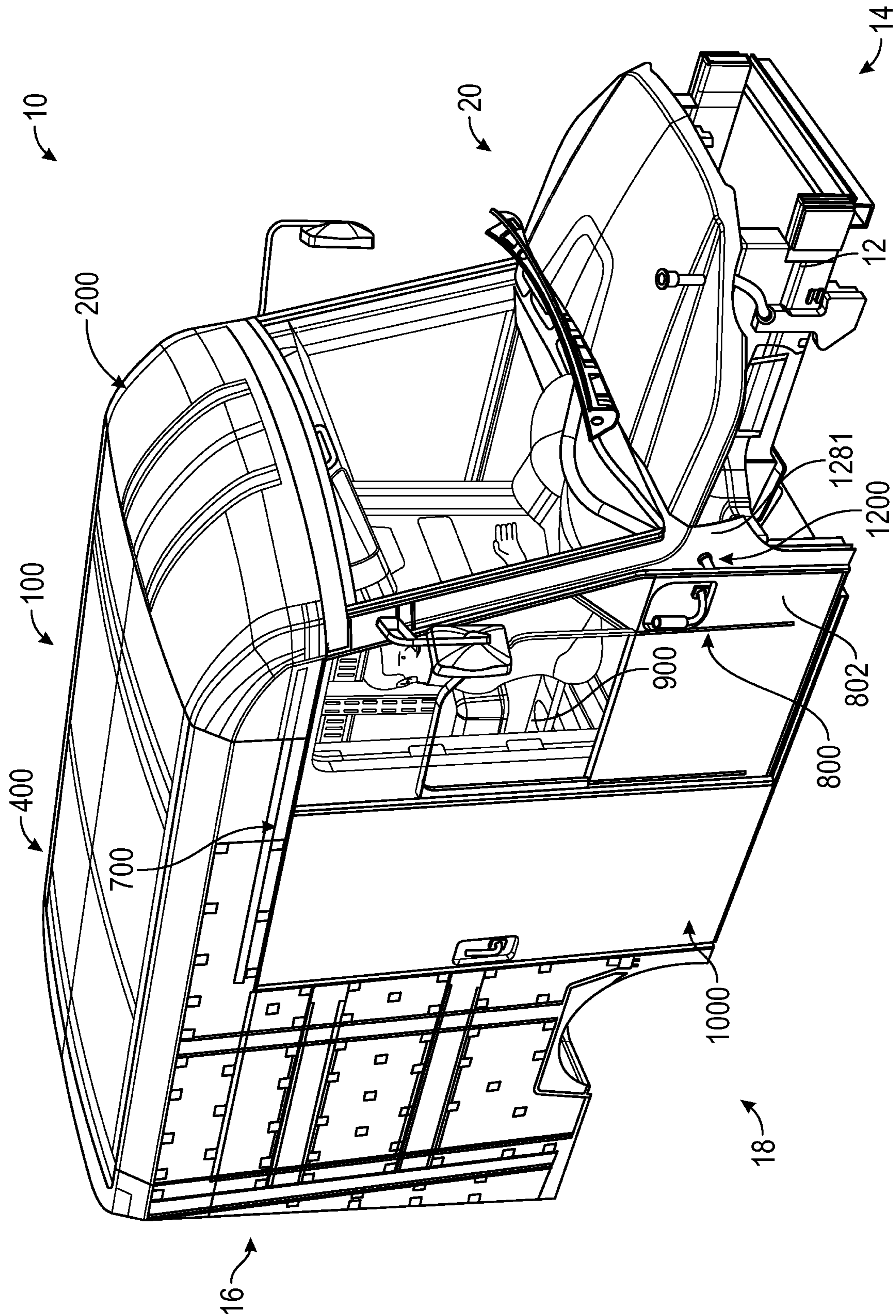


FIG. 7

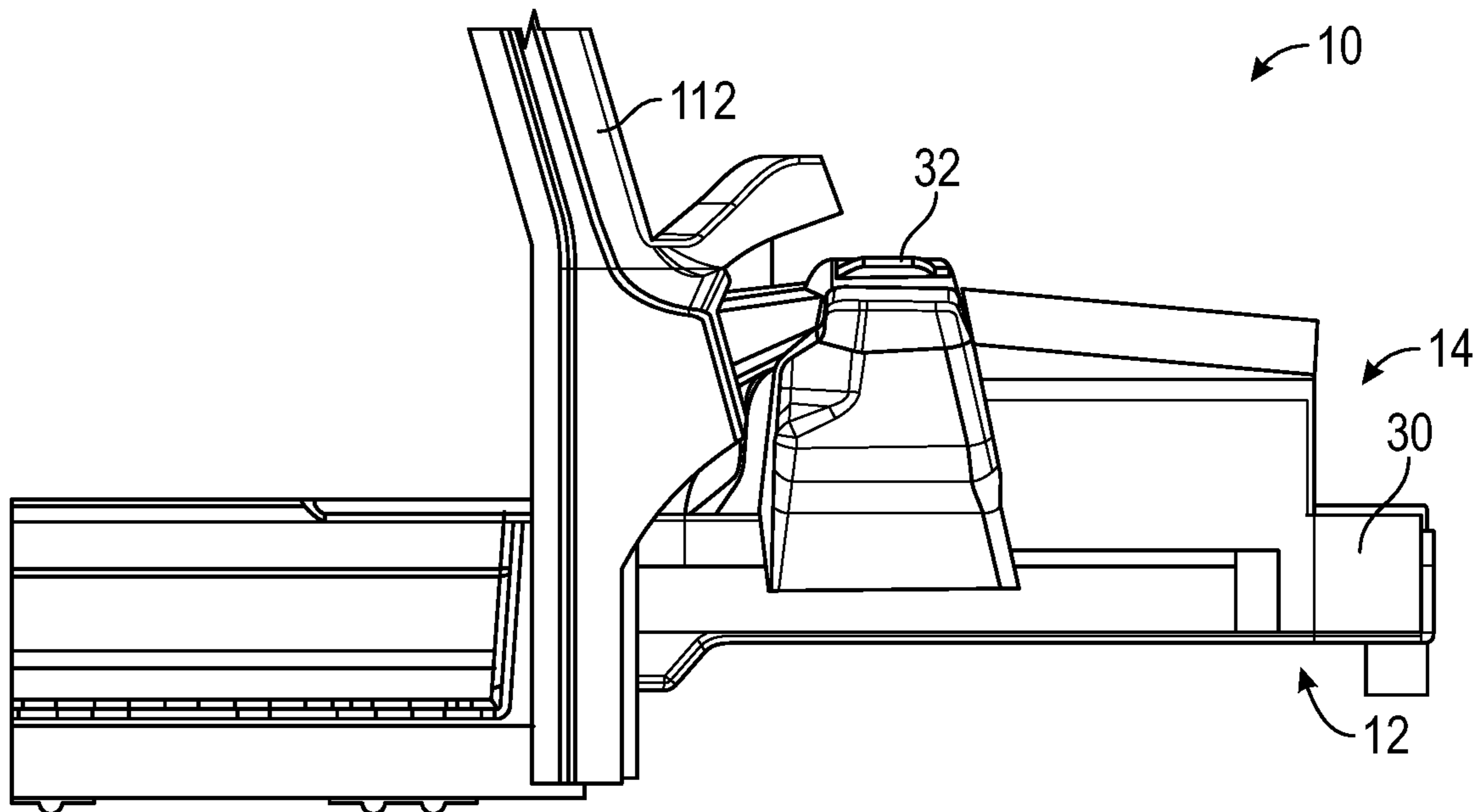


FIG. 8

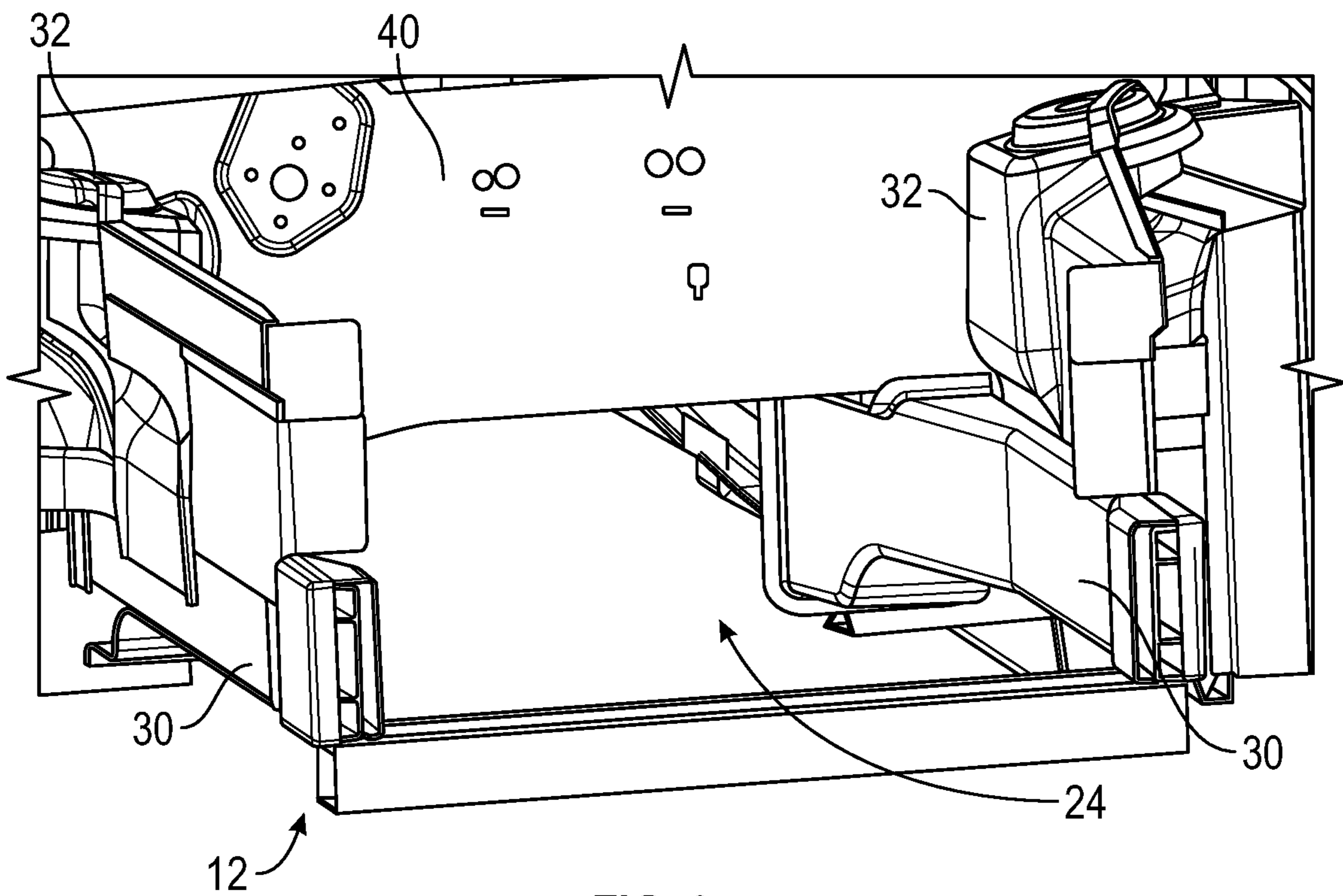


FIG. 9

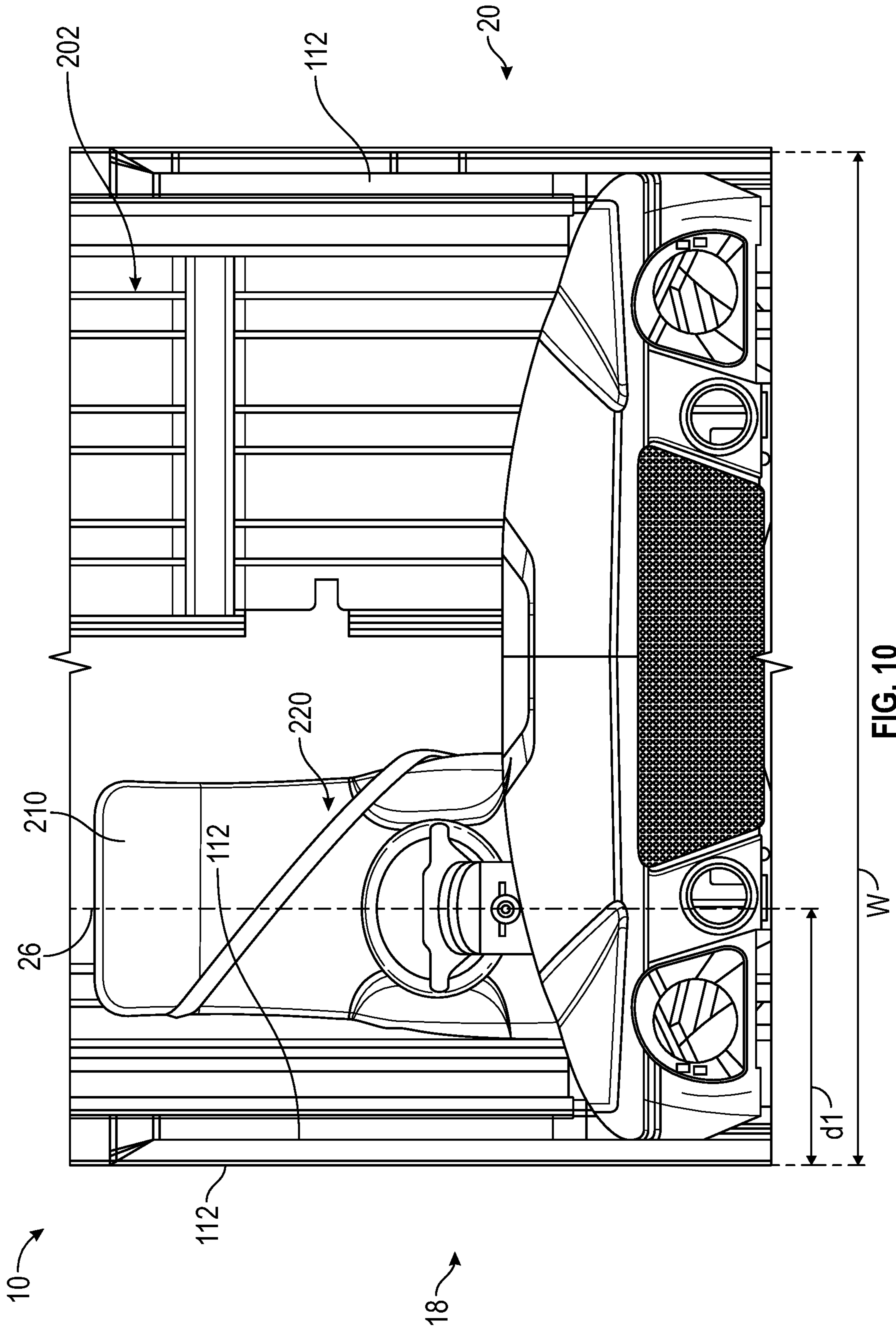


FIG. 10

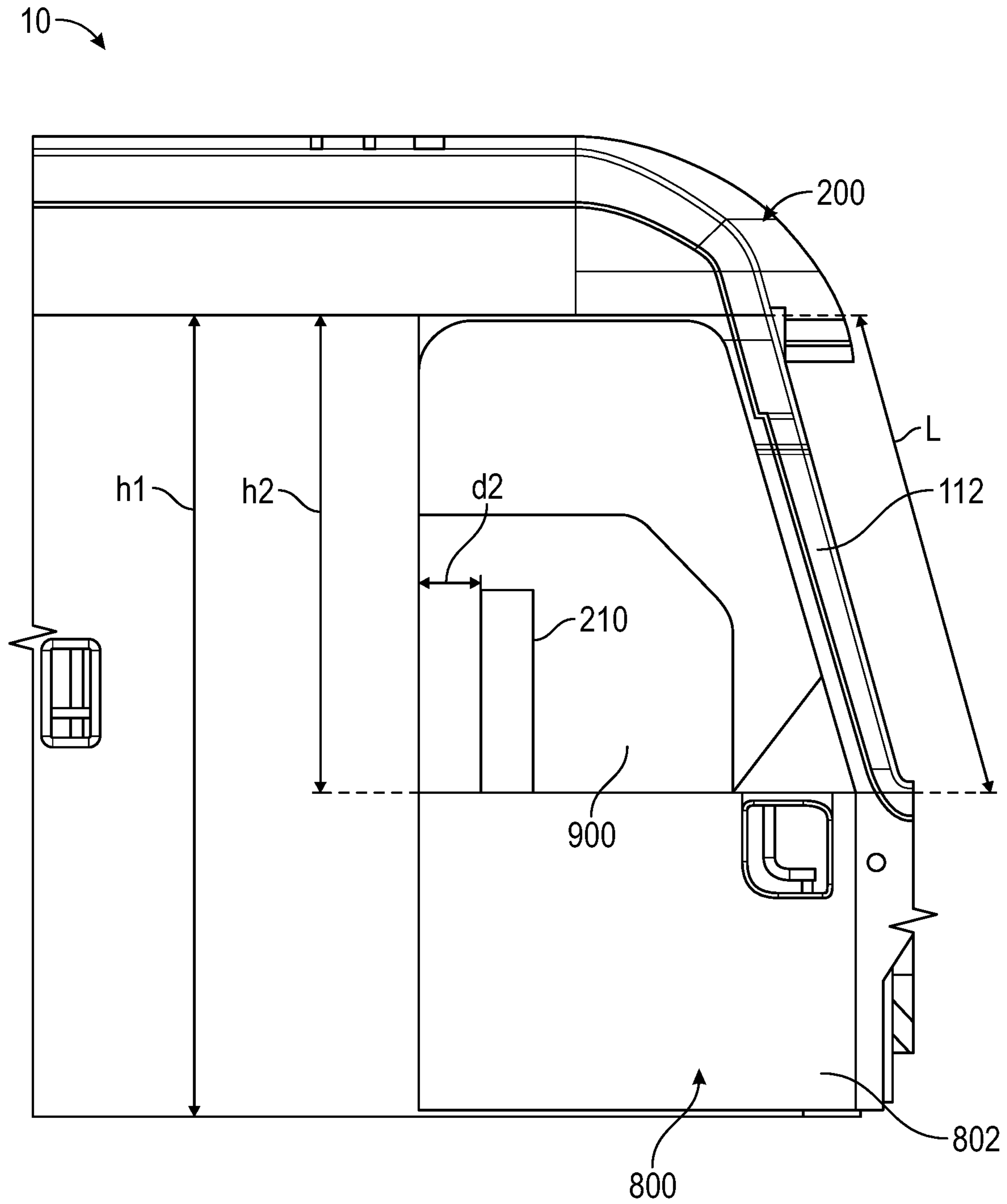


FIG. 11

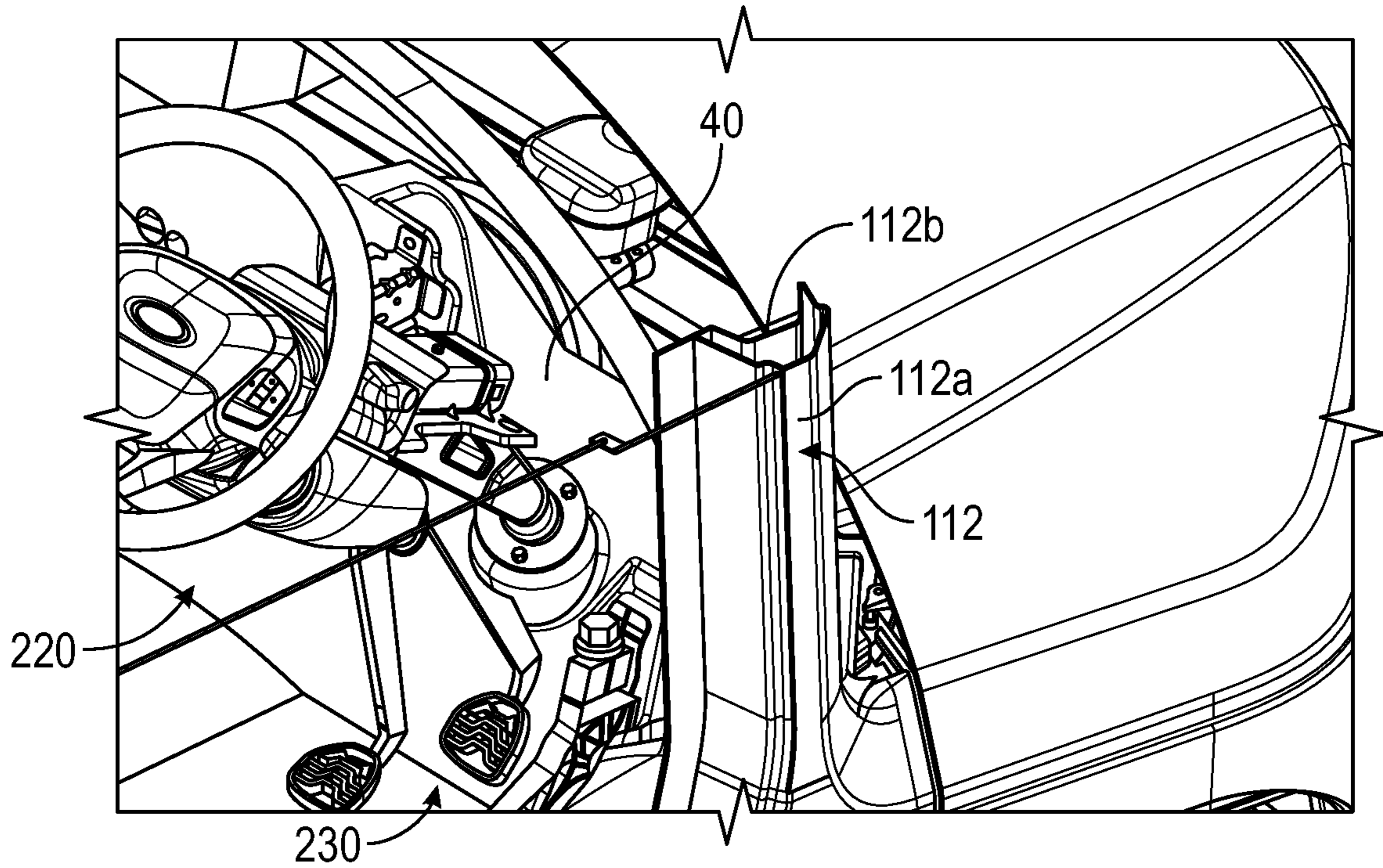


FIG. 12

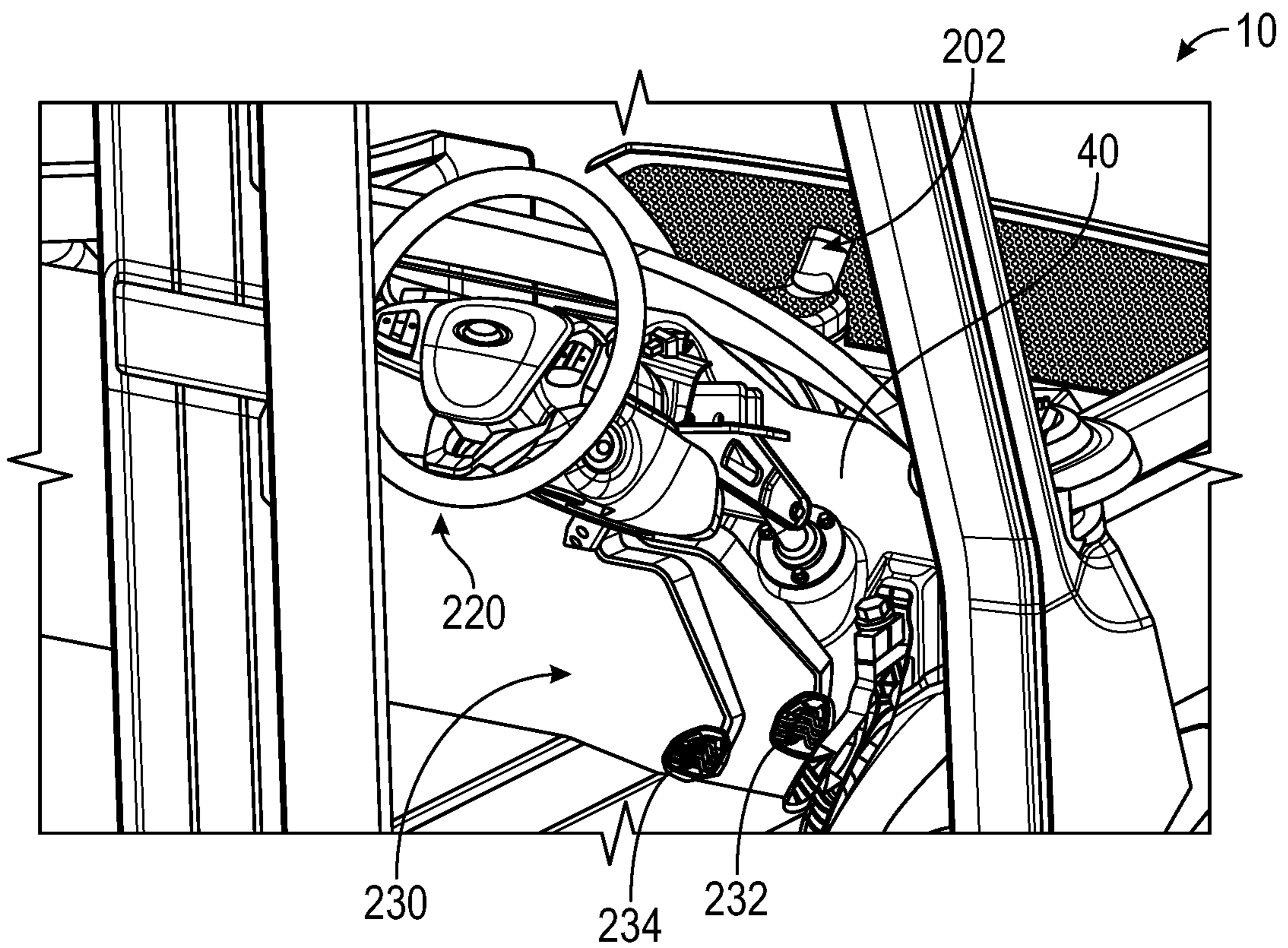


FIG. 13

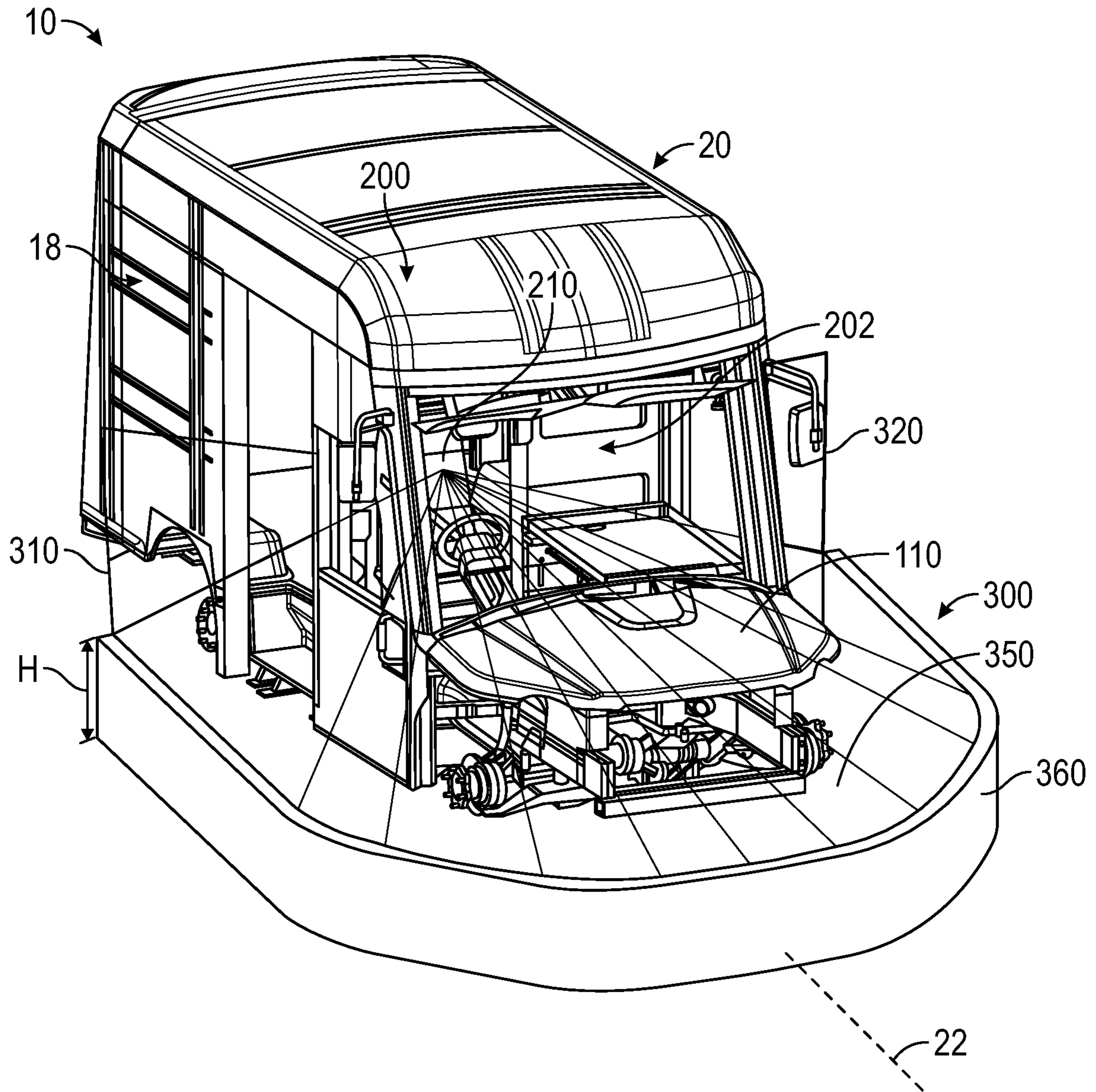


FIG. 14

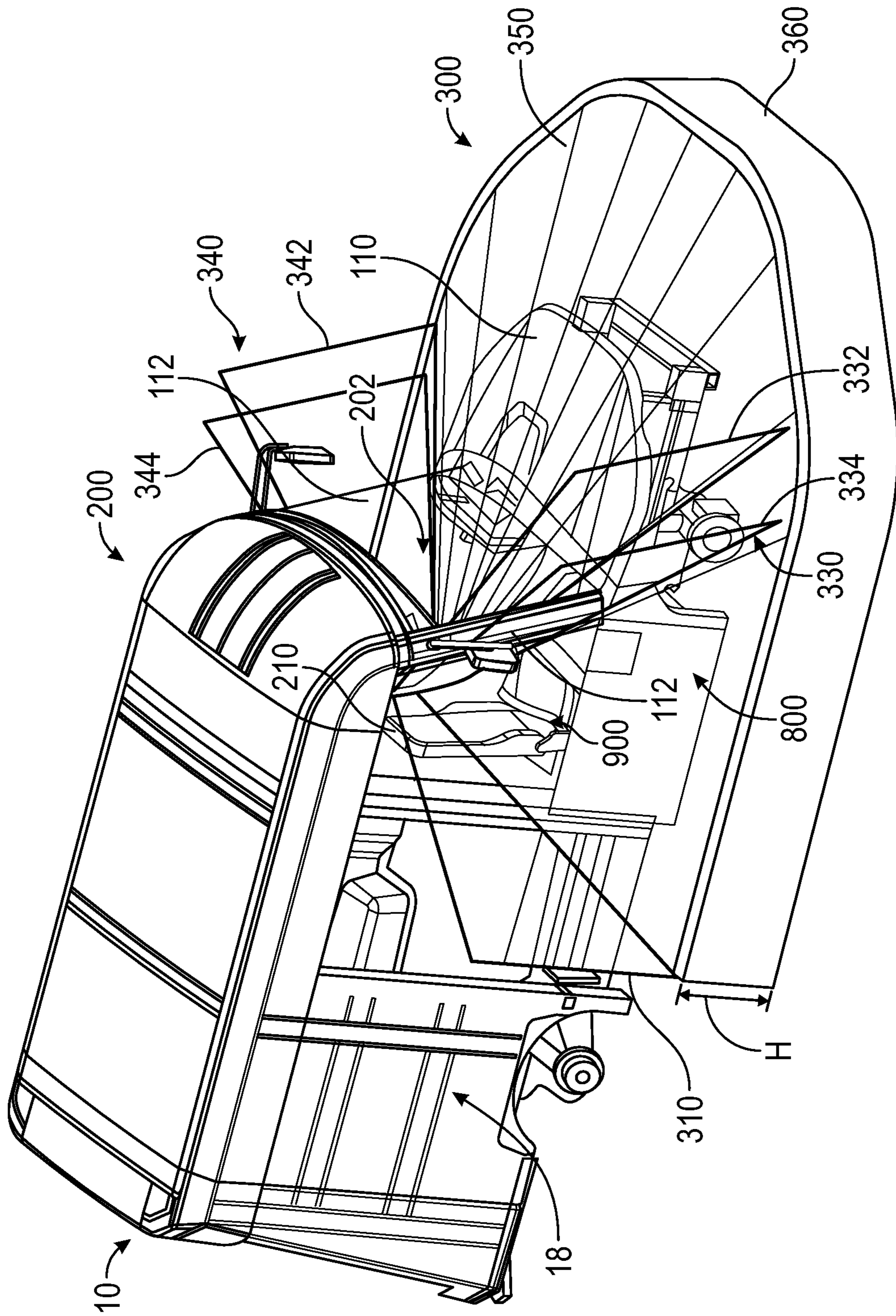


FIG. 15

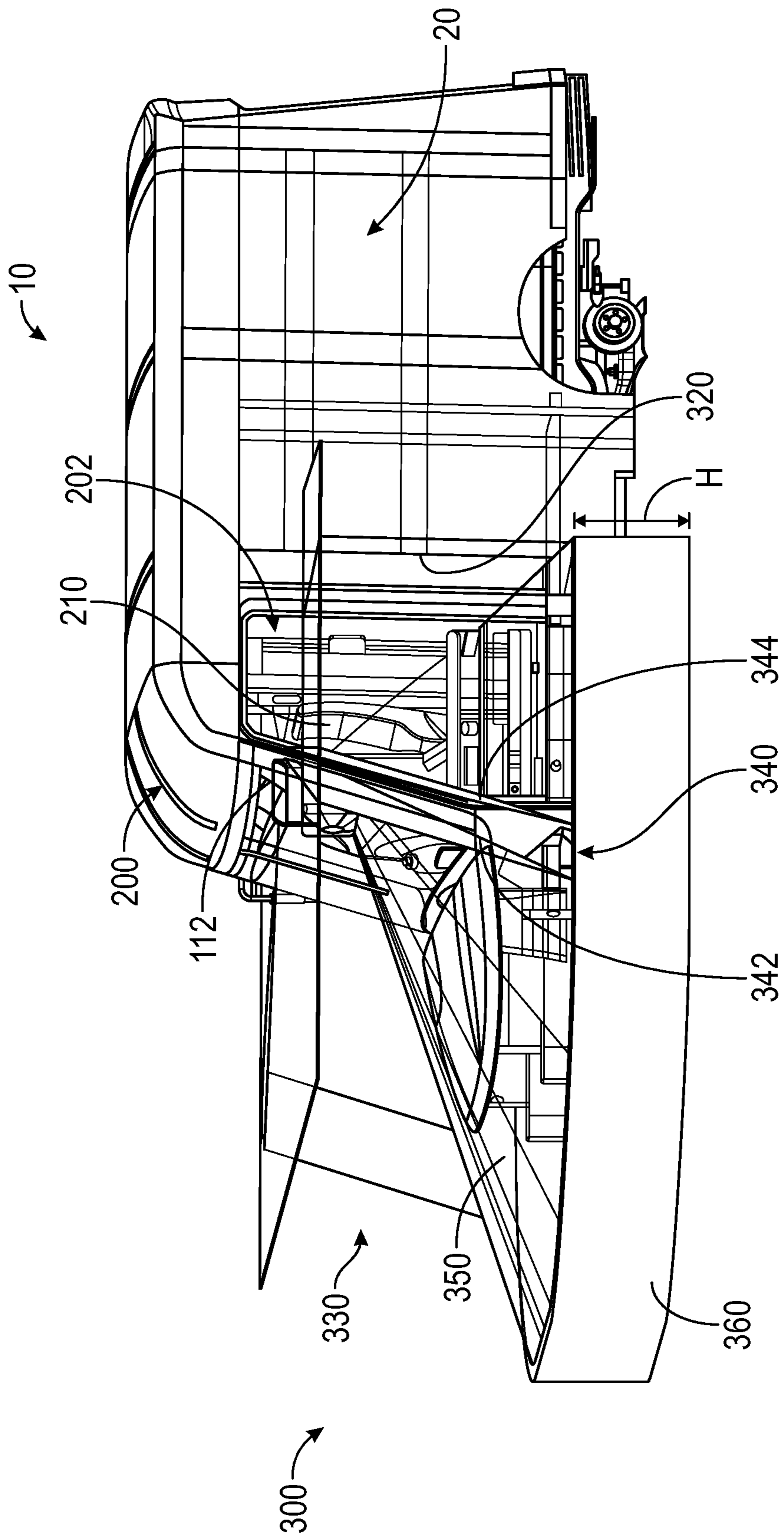


FIG. 16

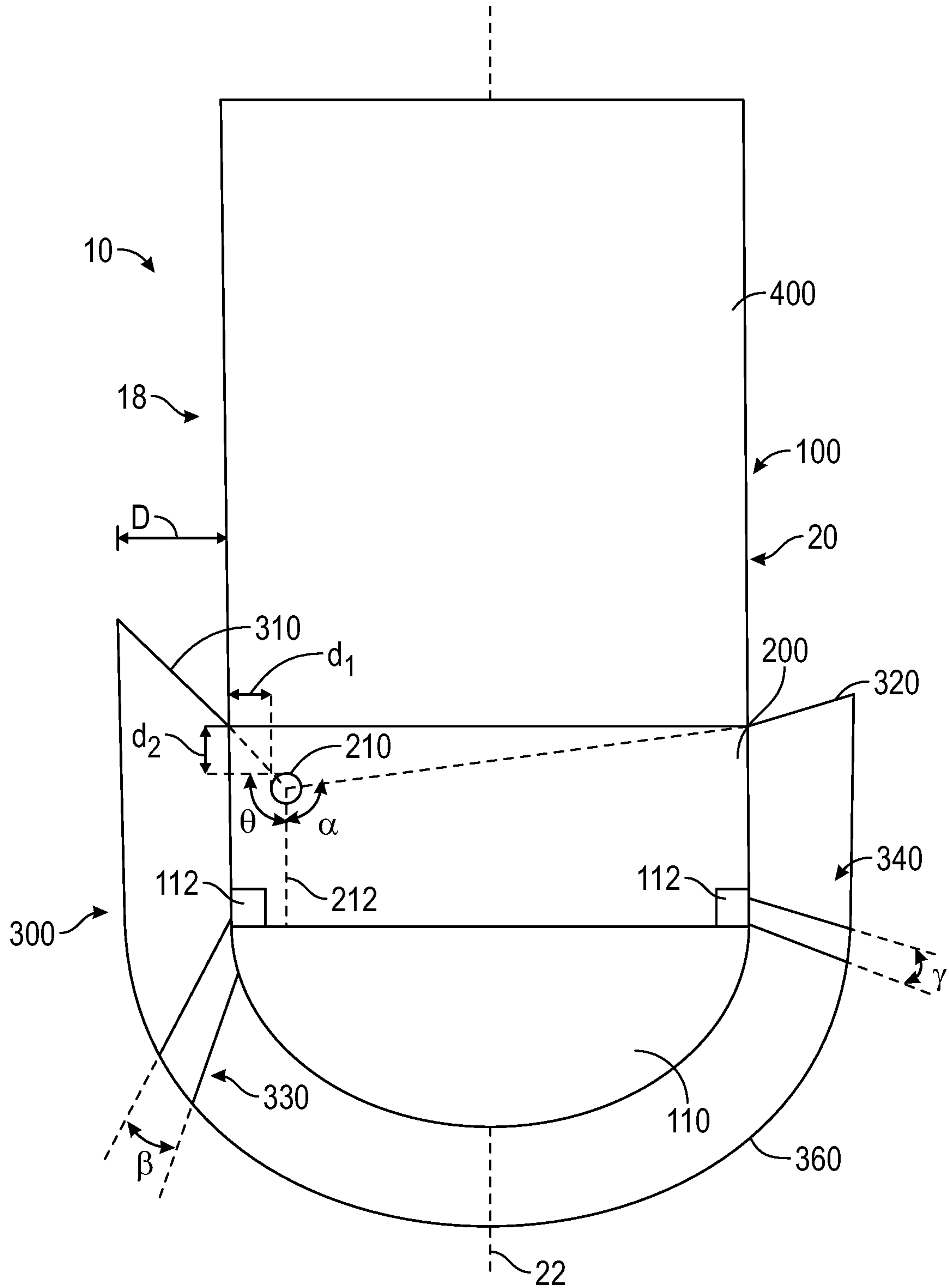


FIG. 17

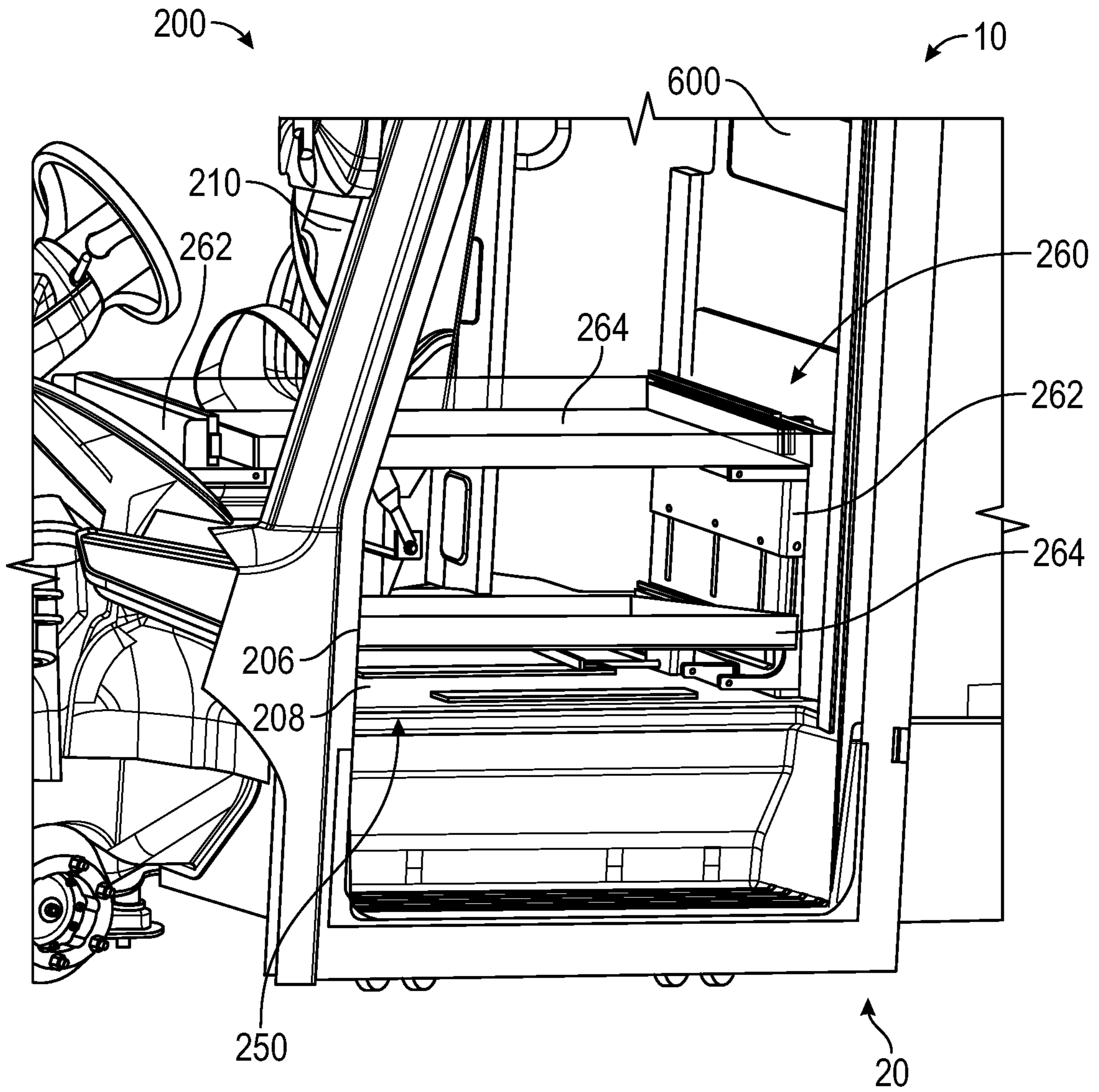


FIG. 18

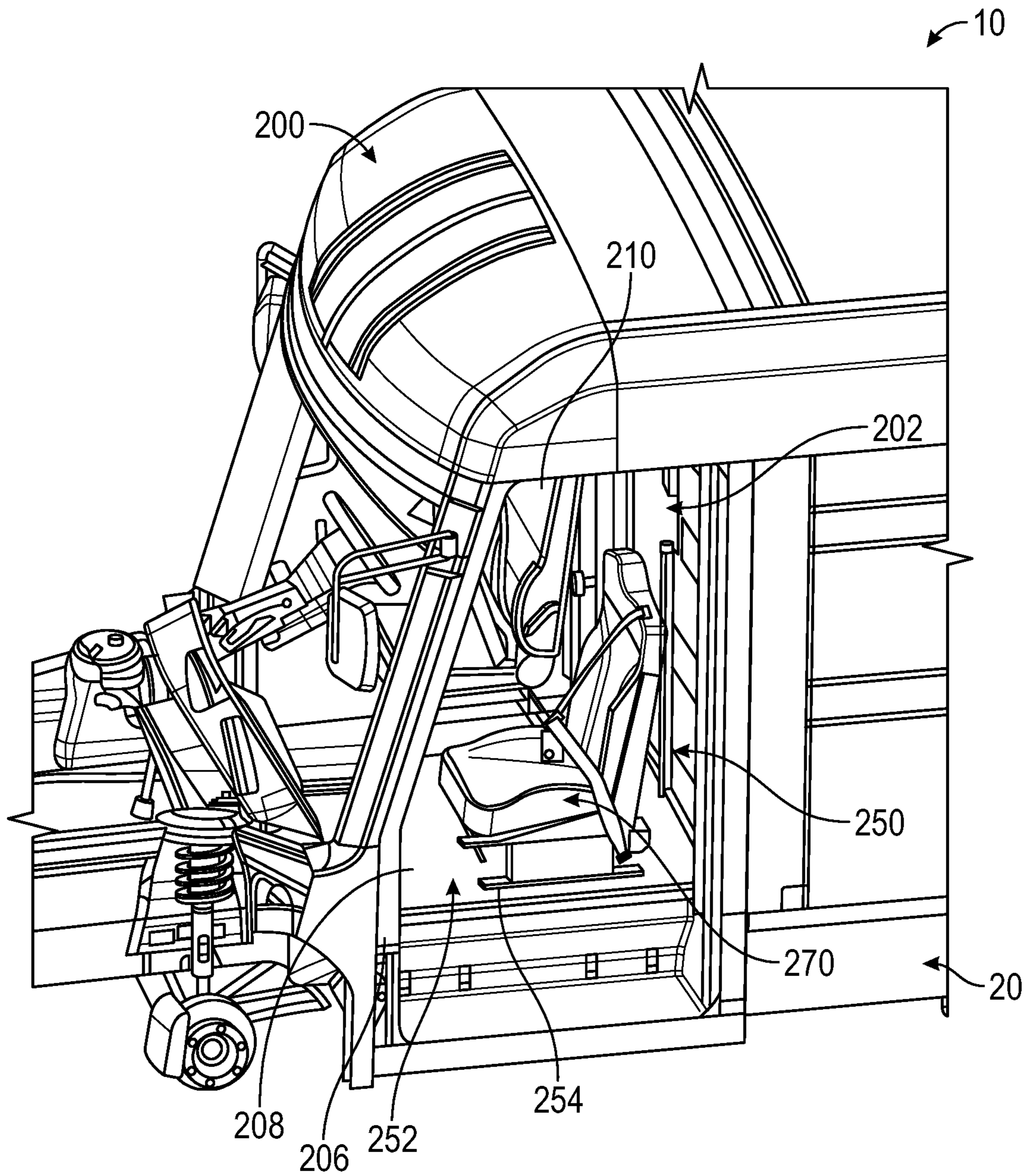


FIG. 19

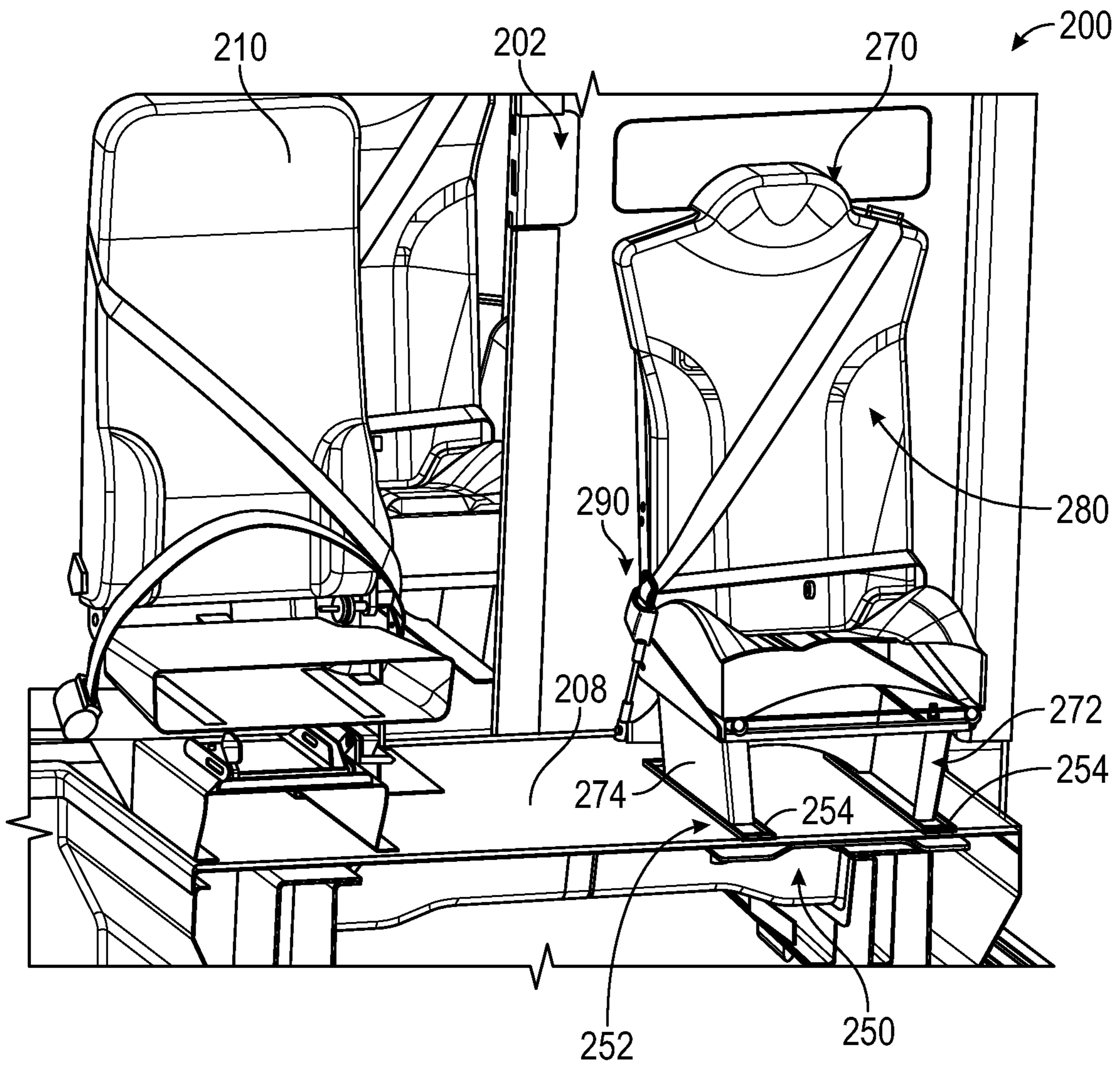


FIG. 20

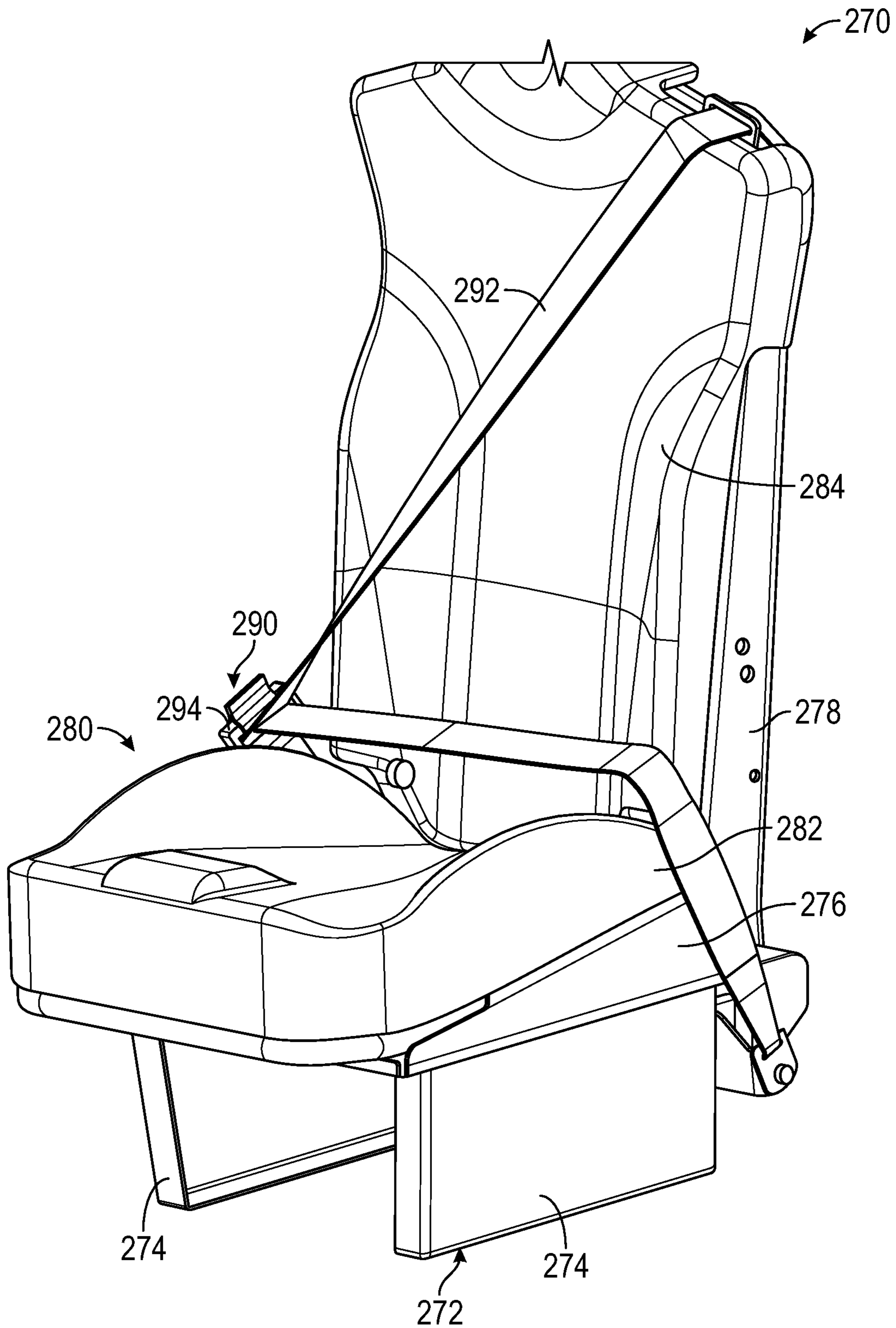


FIG. 21

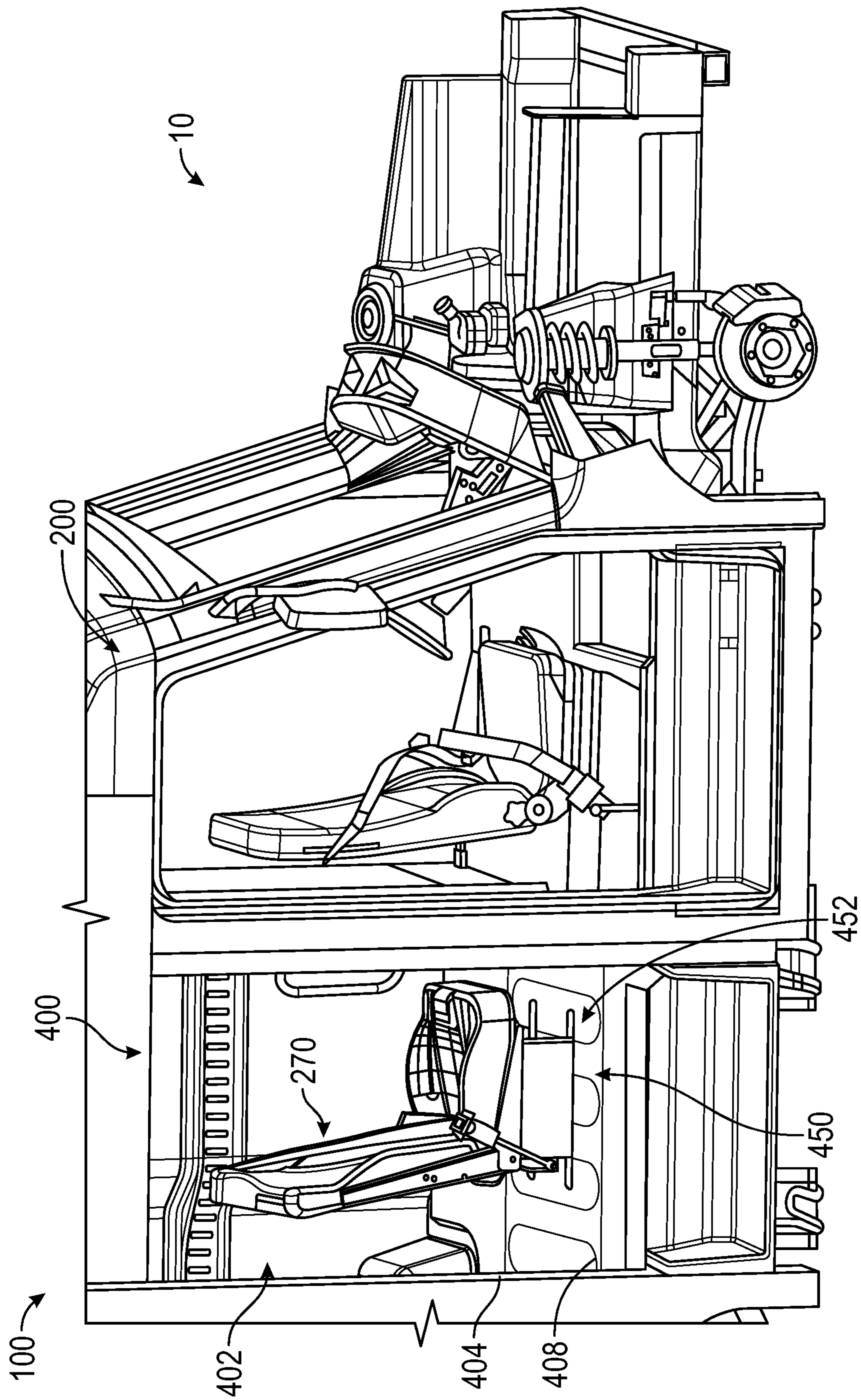


FIG. 22

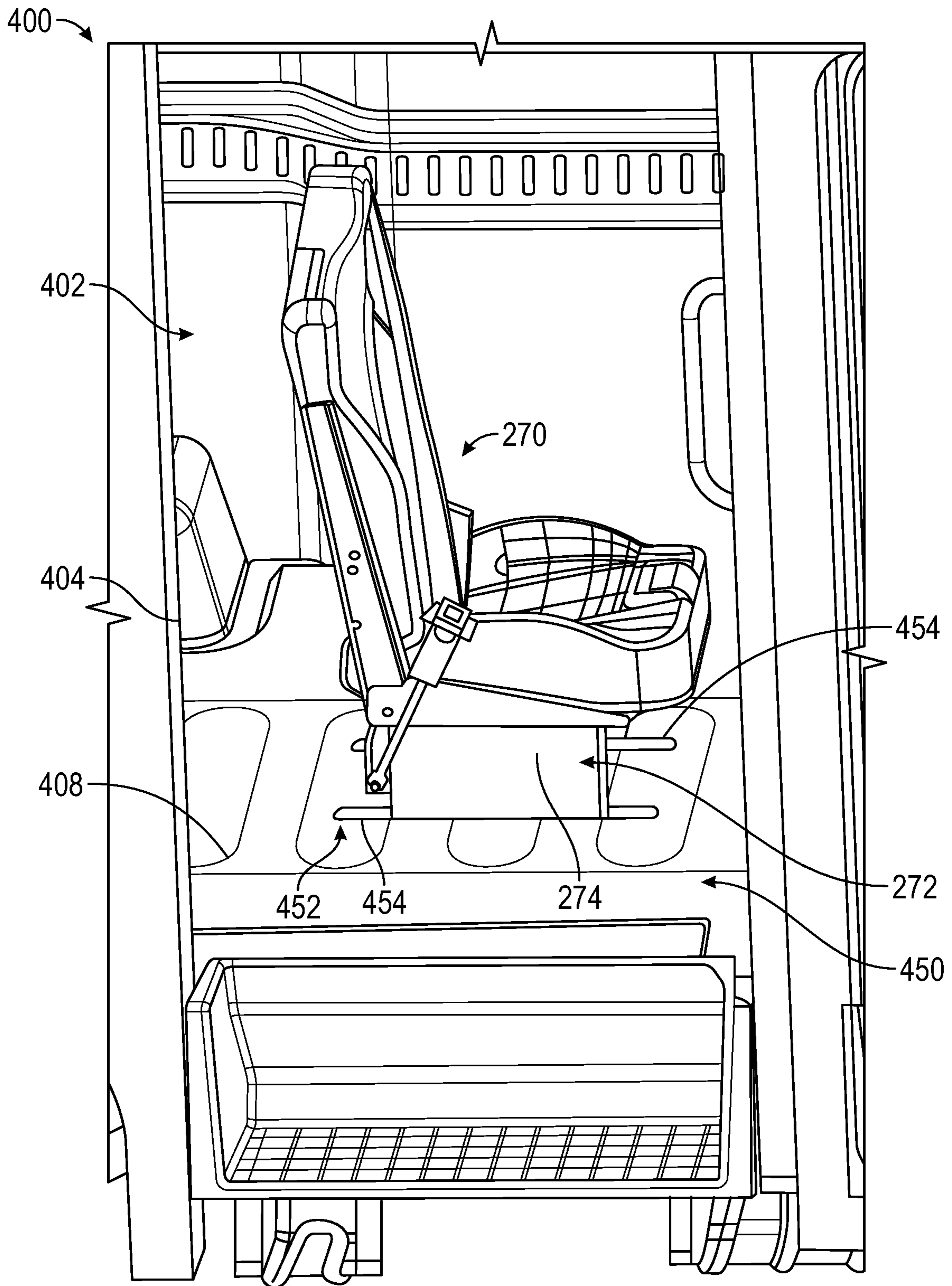


FIG. 23

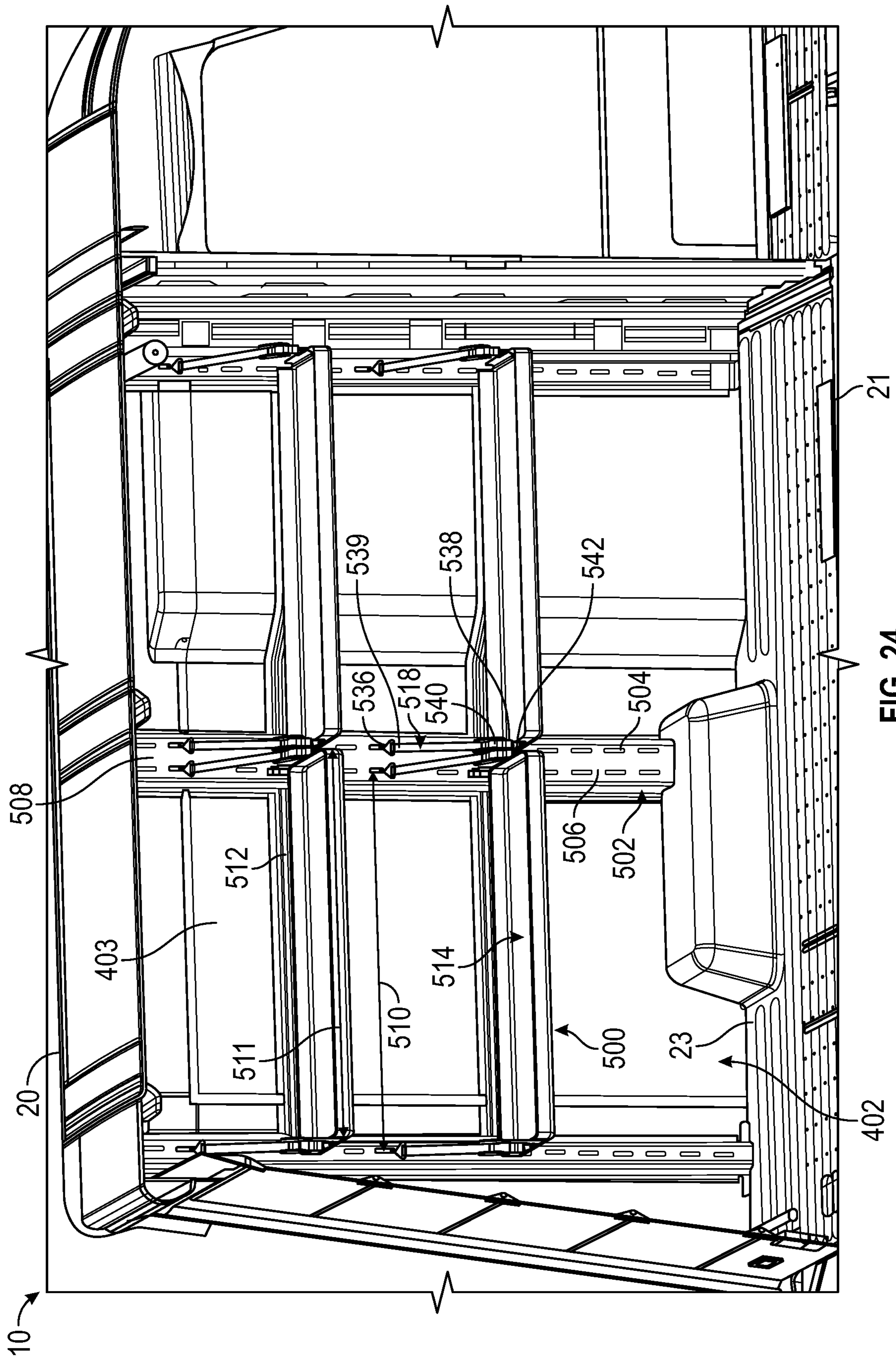


FIG. 24

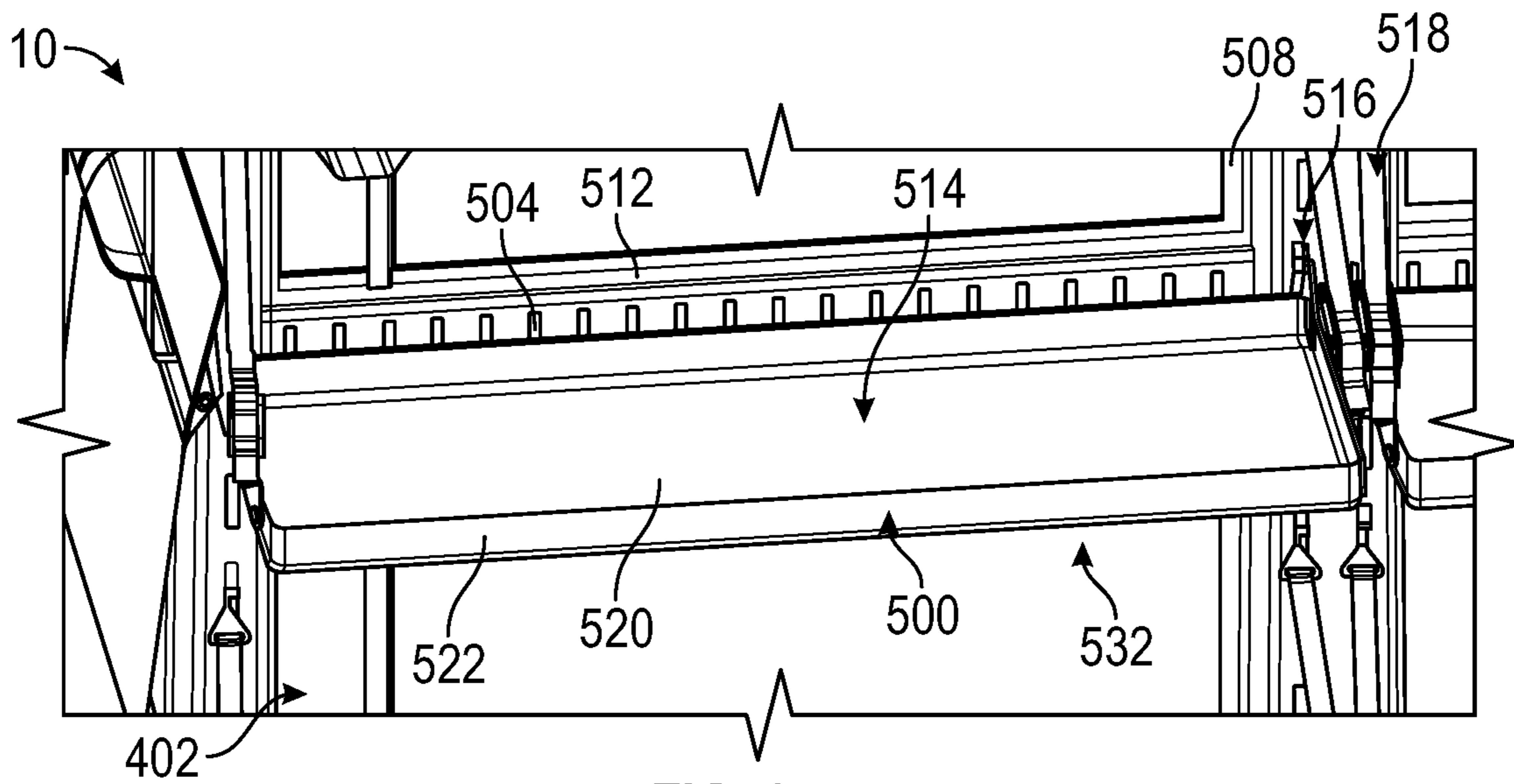


FIG. 25

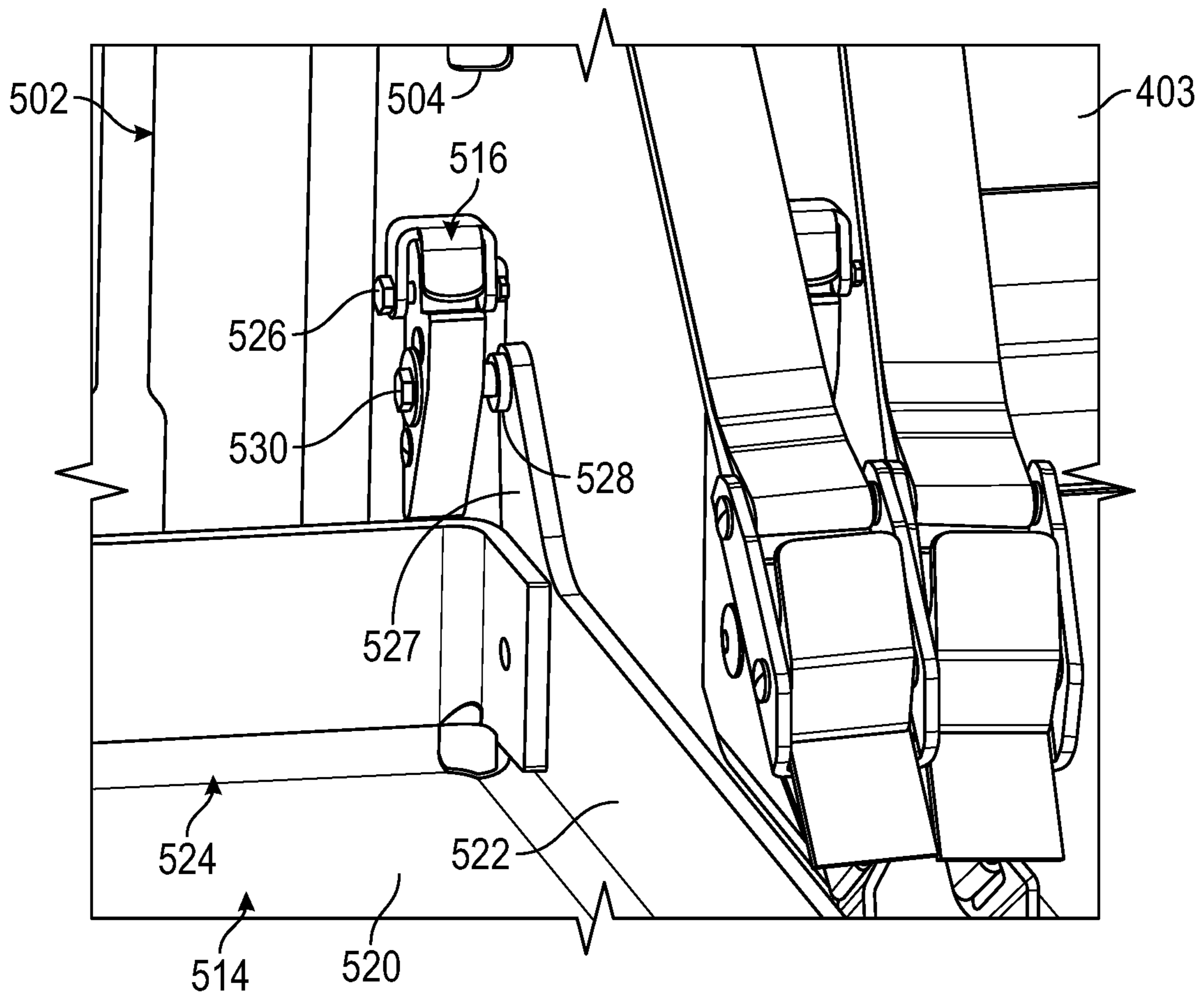


FIG. 26

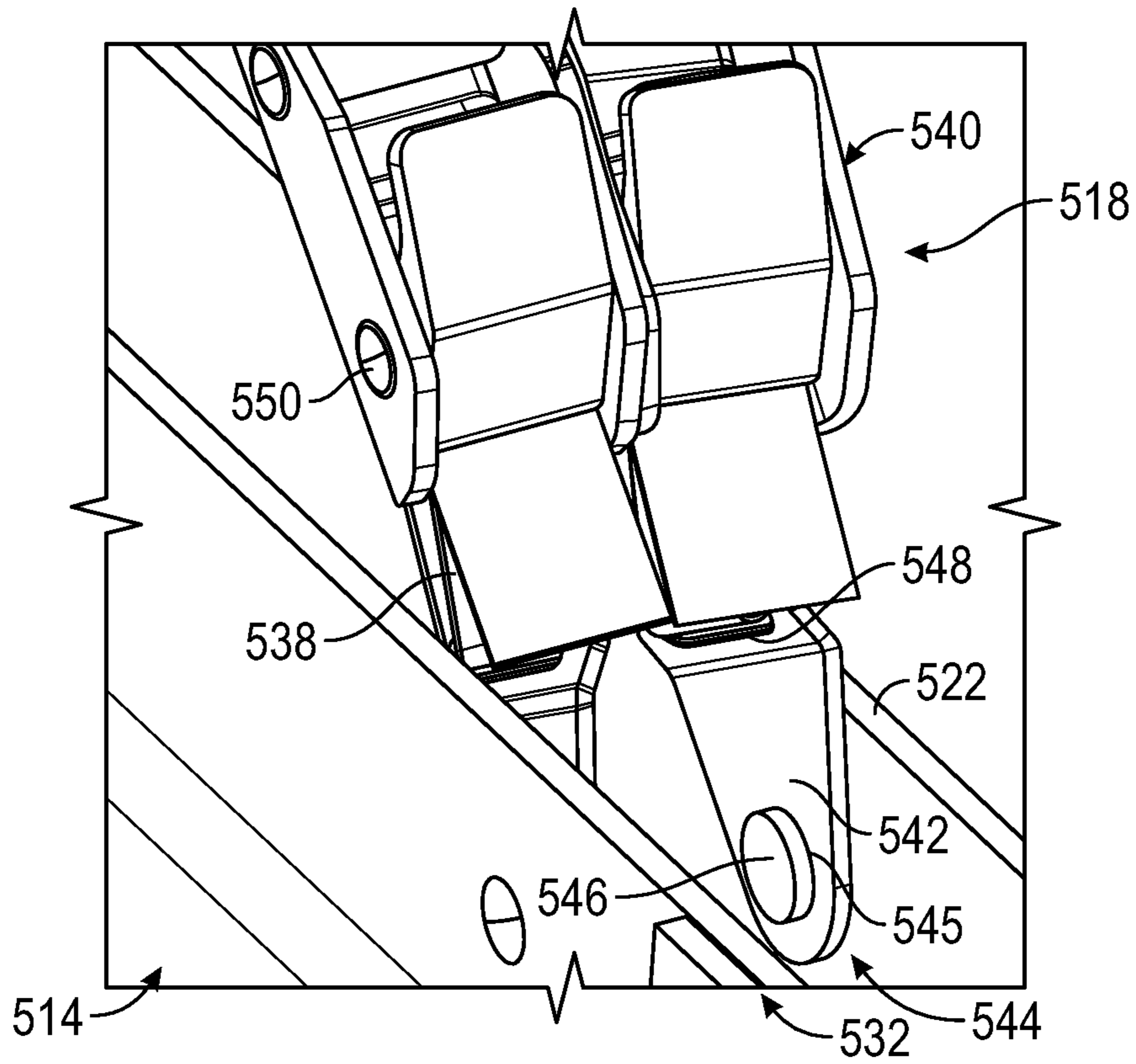


FIG. 27

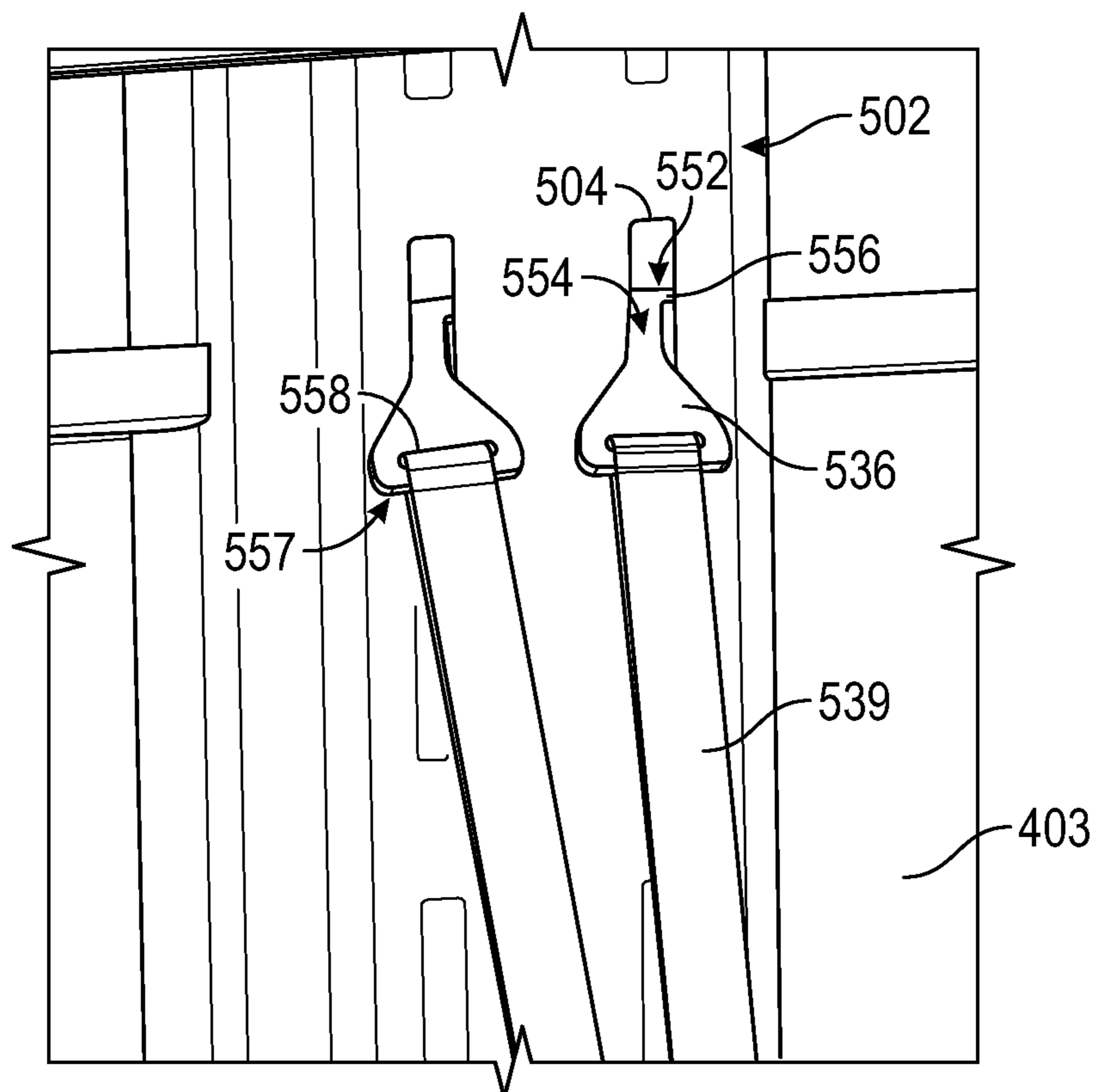


FIG. 28

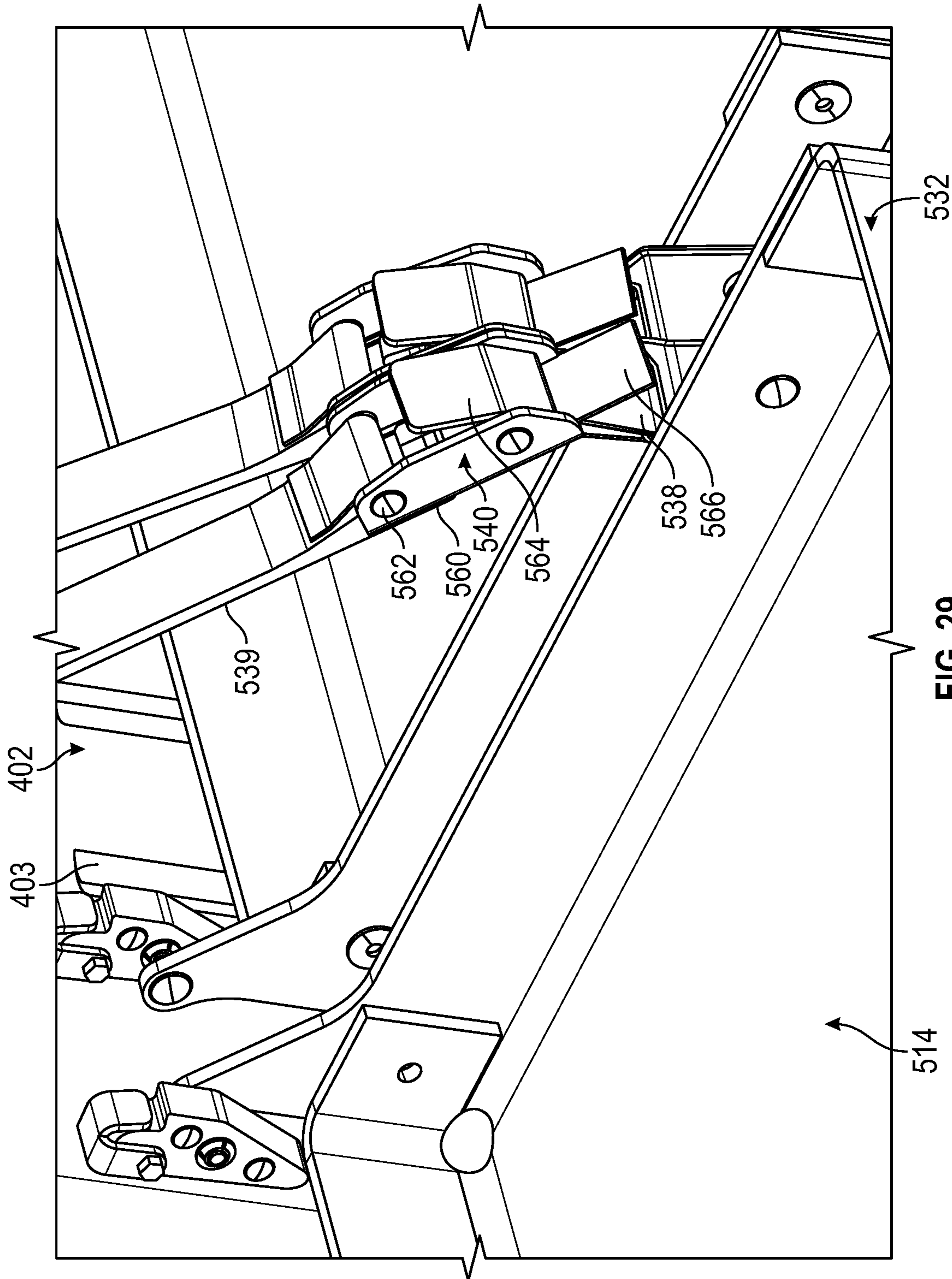


FIG. 29

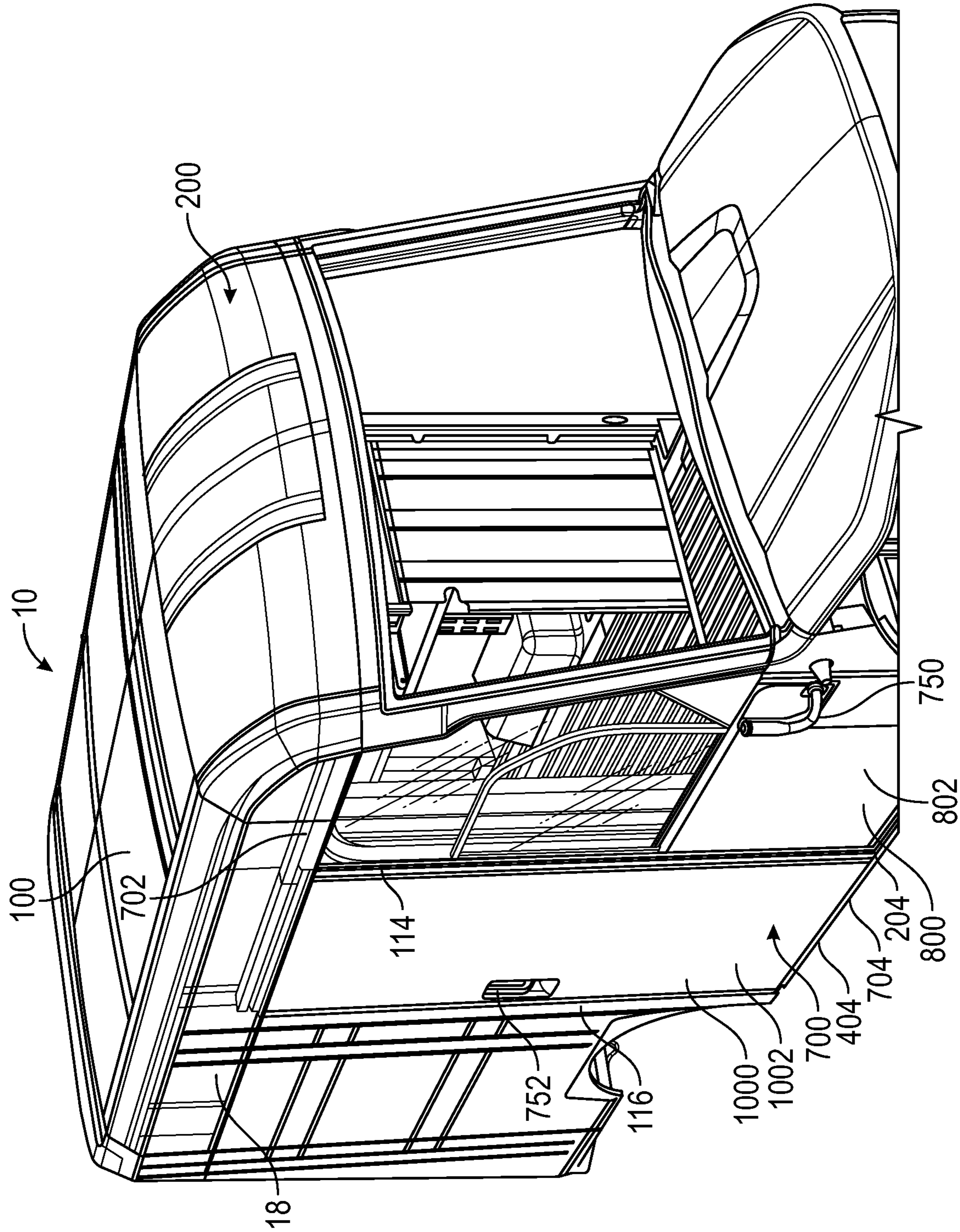


FIG. 30

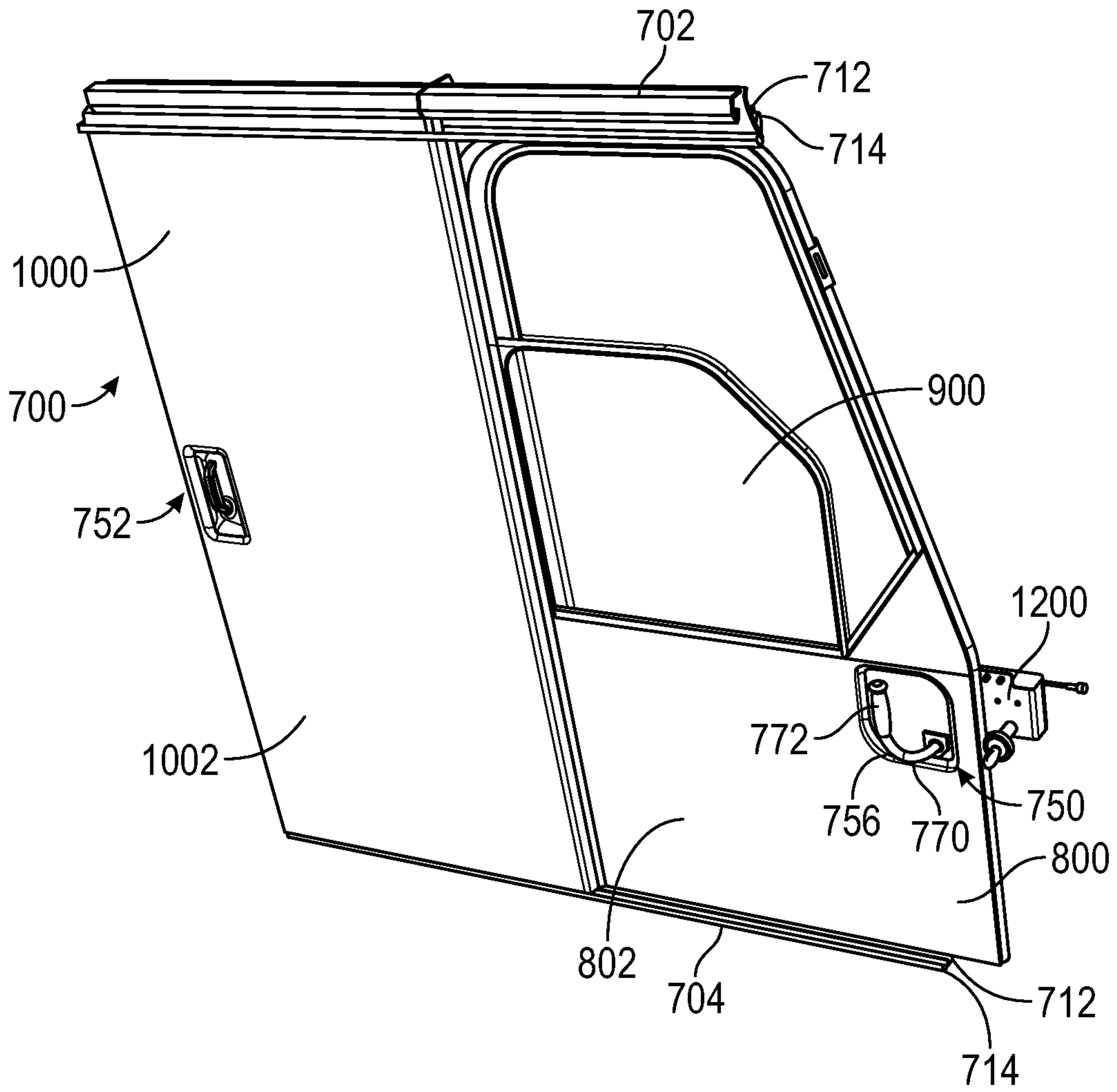


FIG. 31

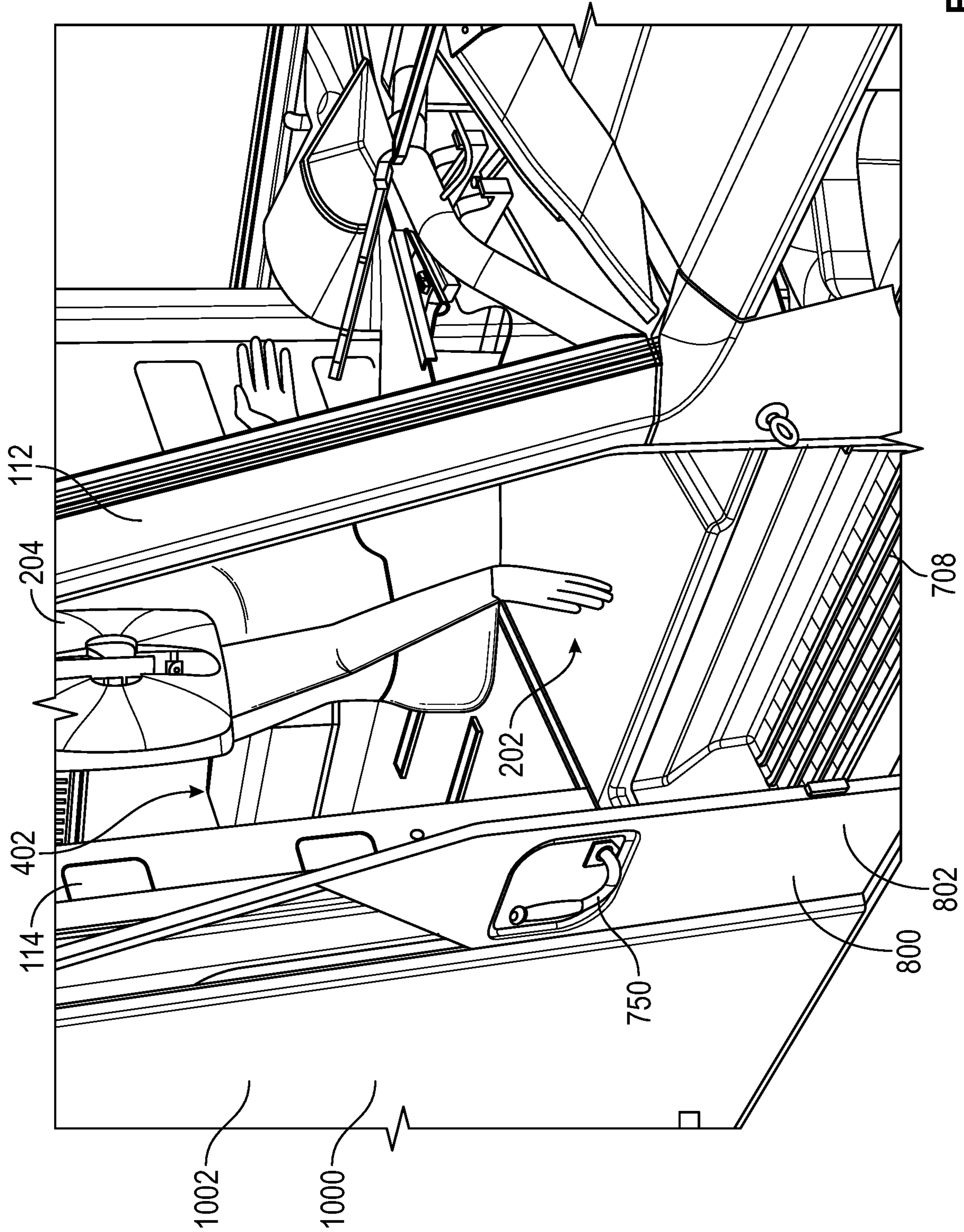


FIG. 32

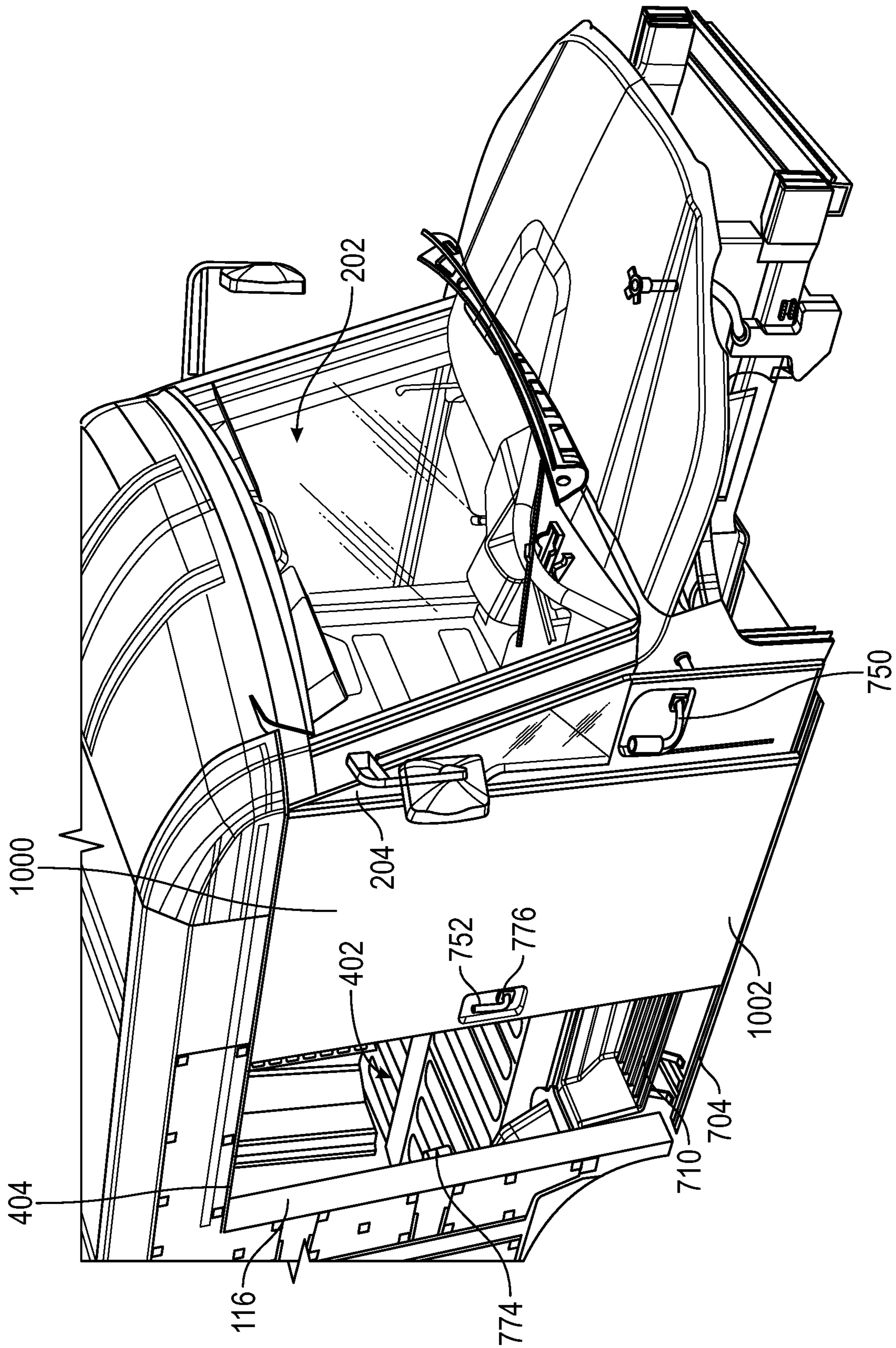


FIG. 33

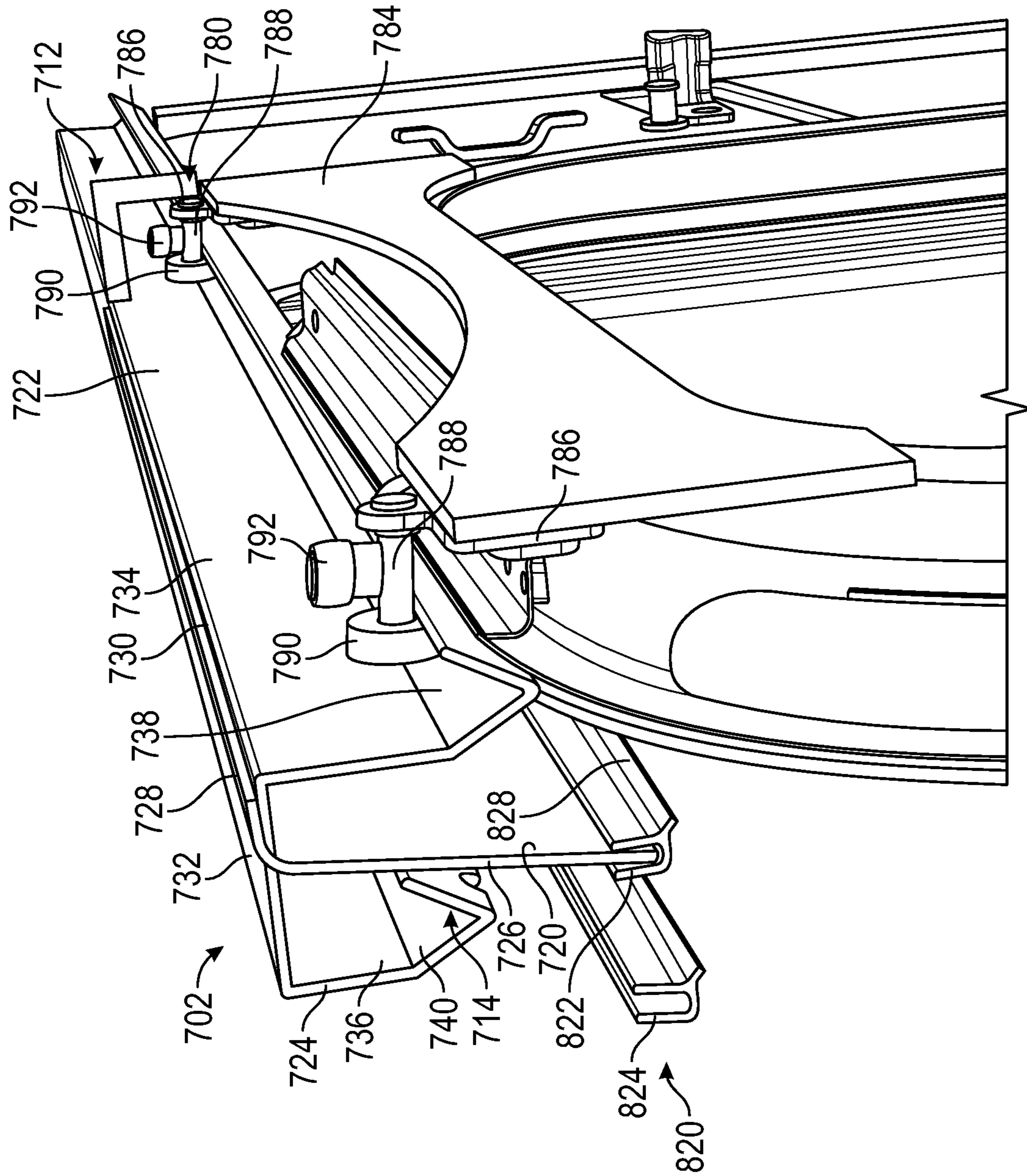


FIG. 34

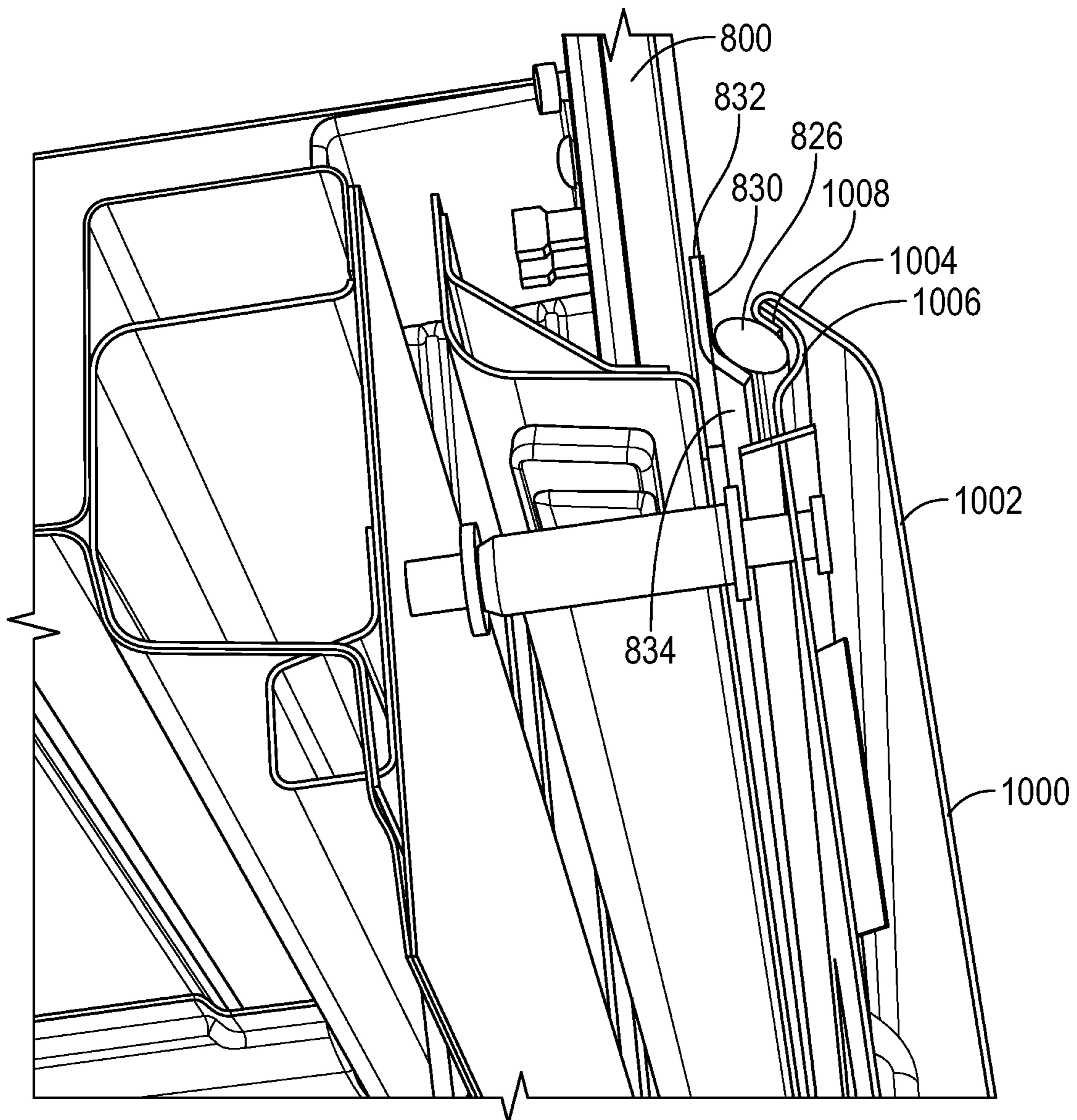


FIG. 35

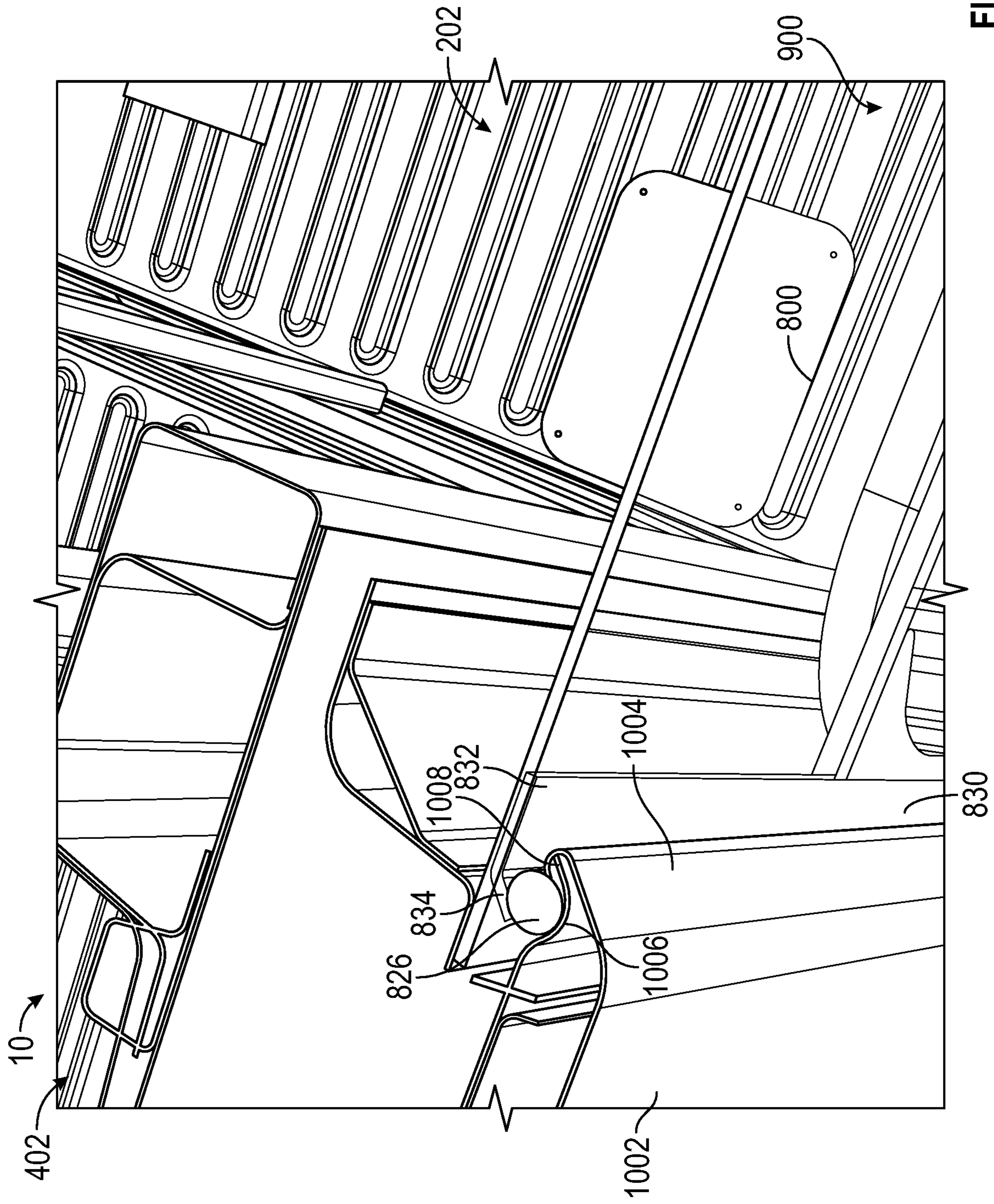


FIG. 36

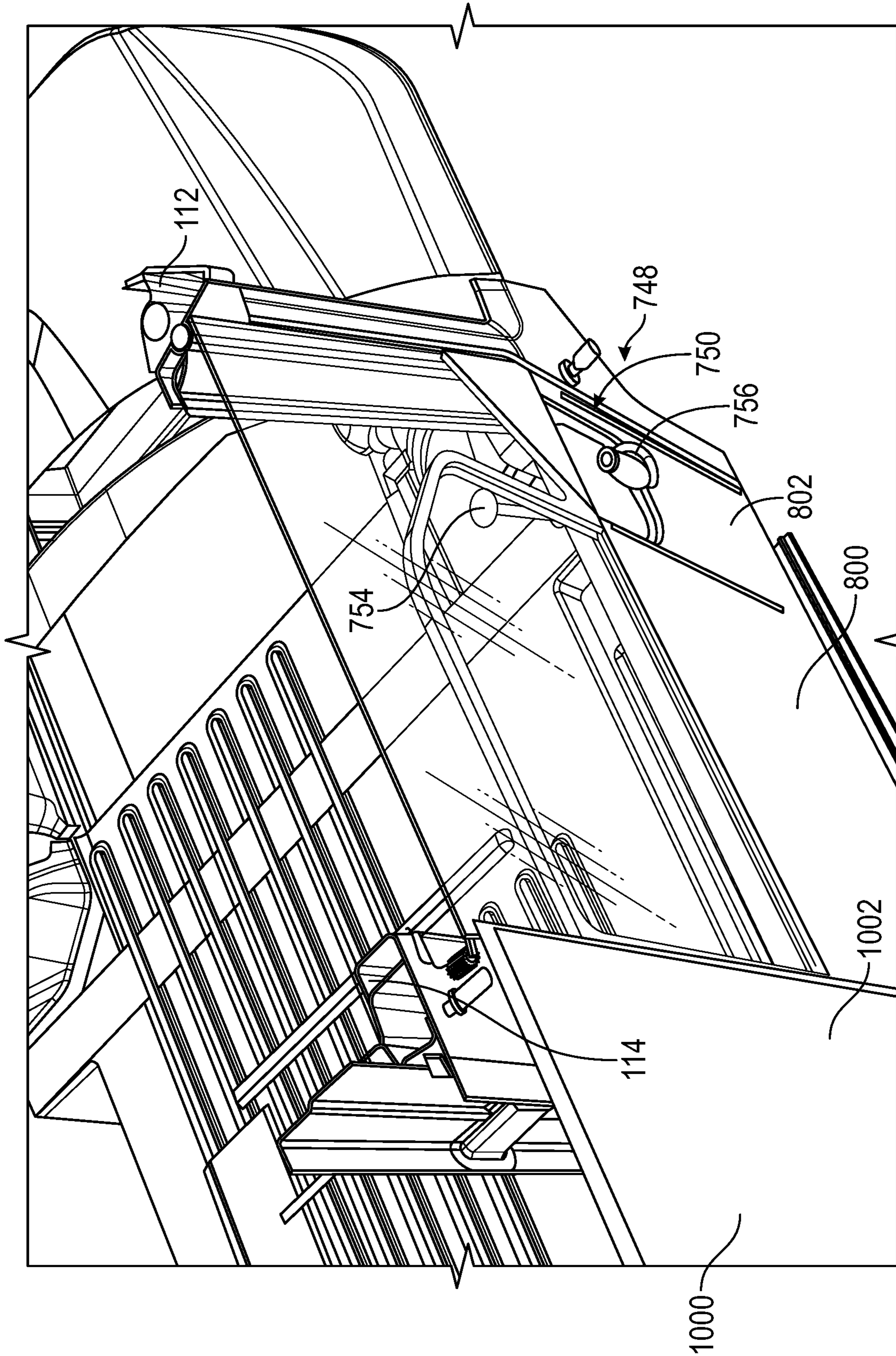


FIG. 37

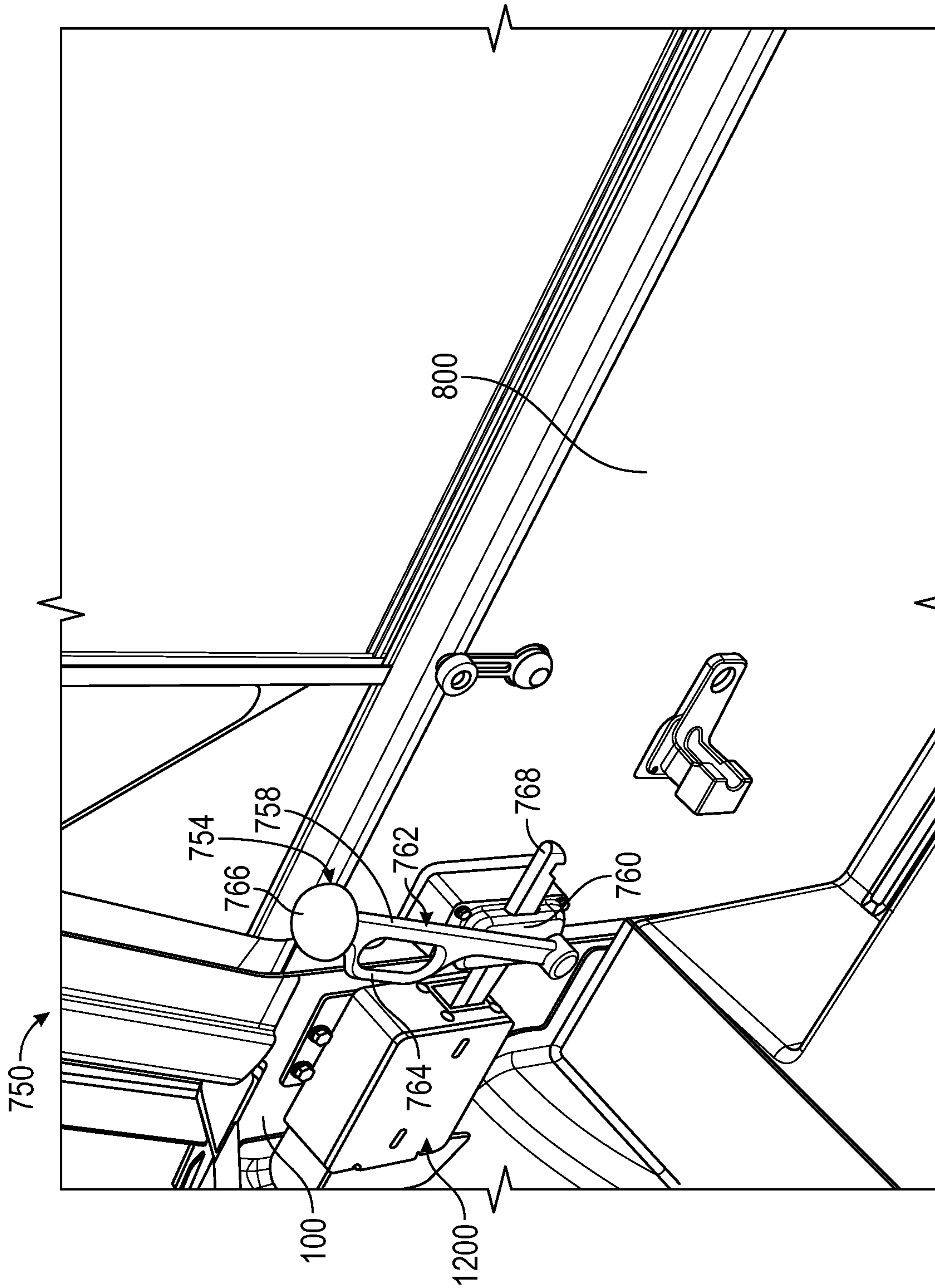


FIG. 38

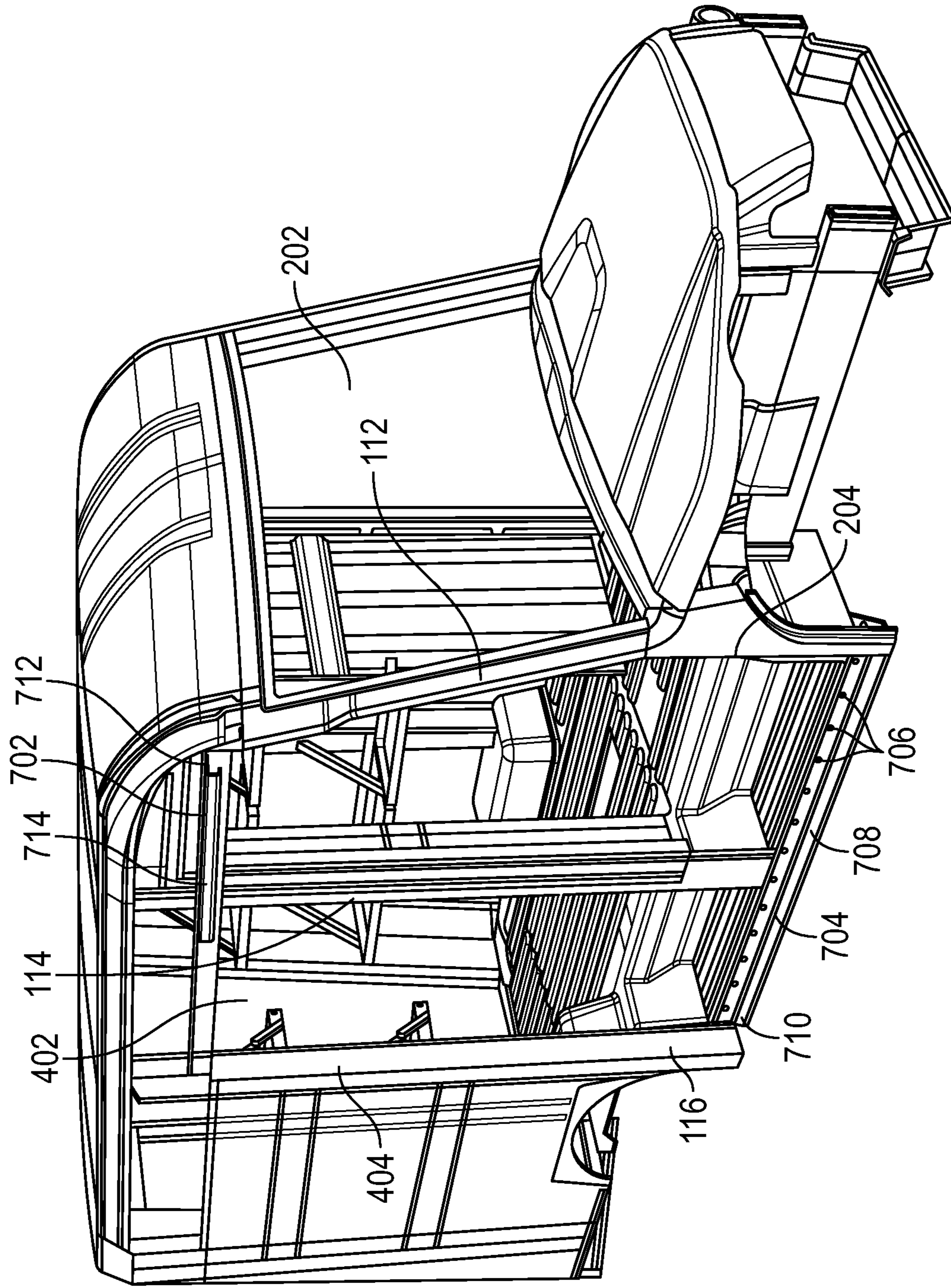


FIG. 39

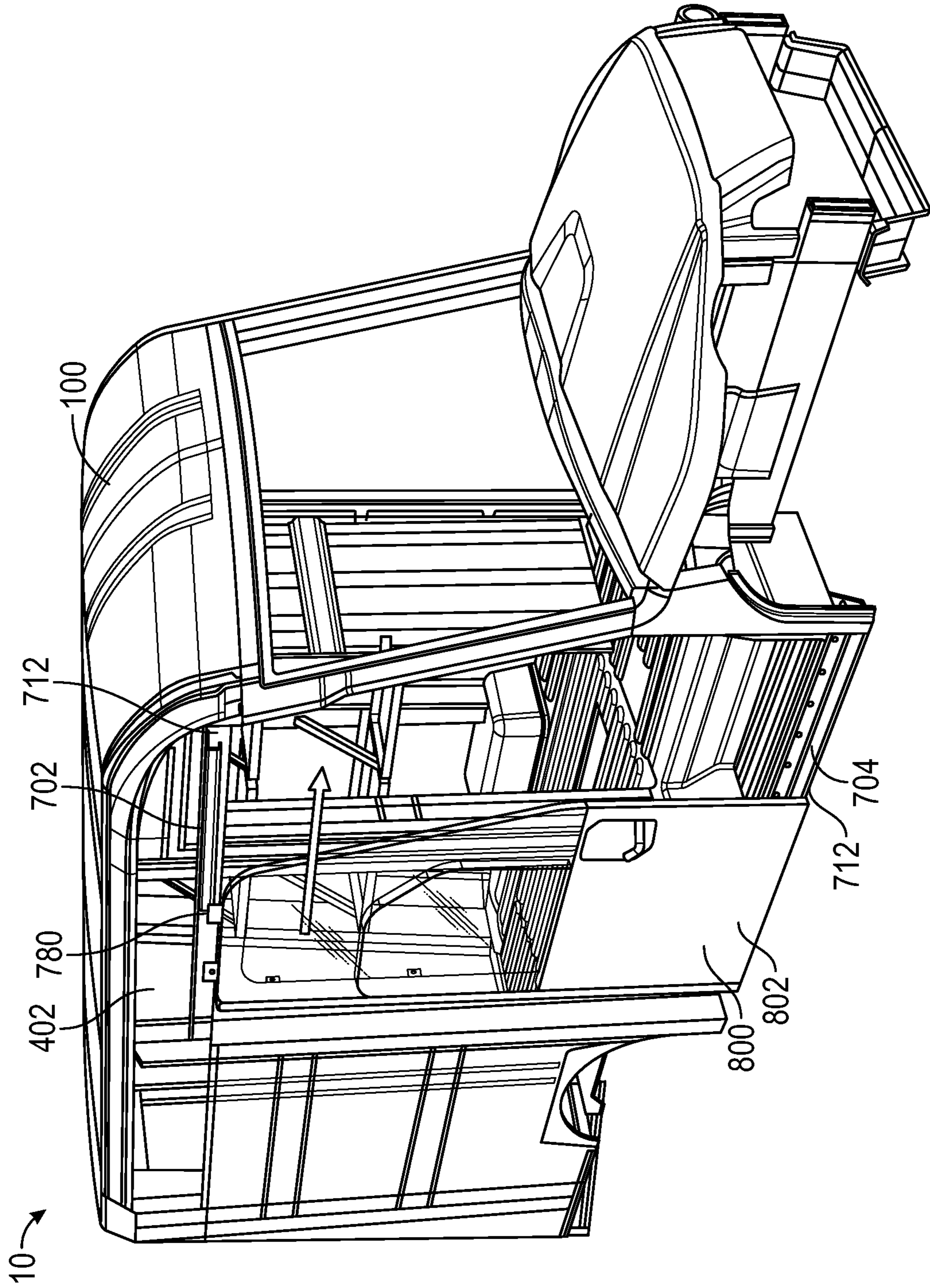


FIG. 40

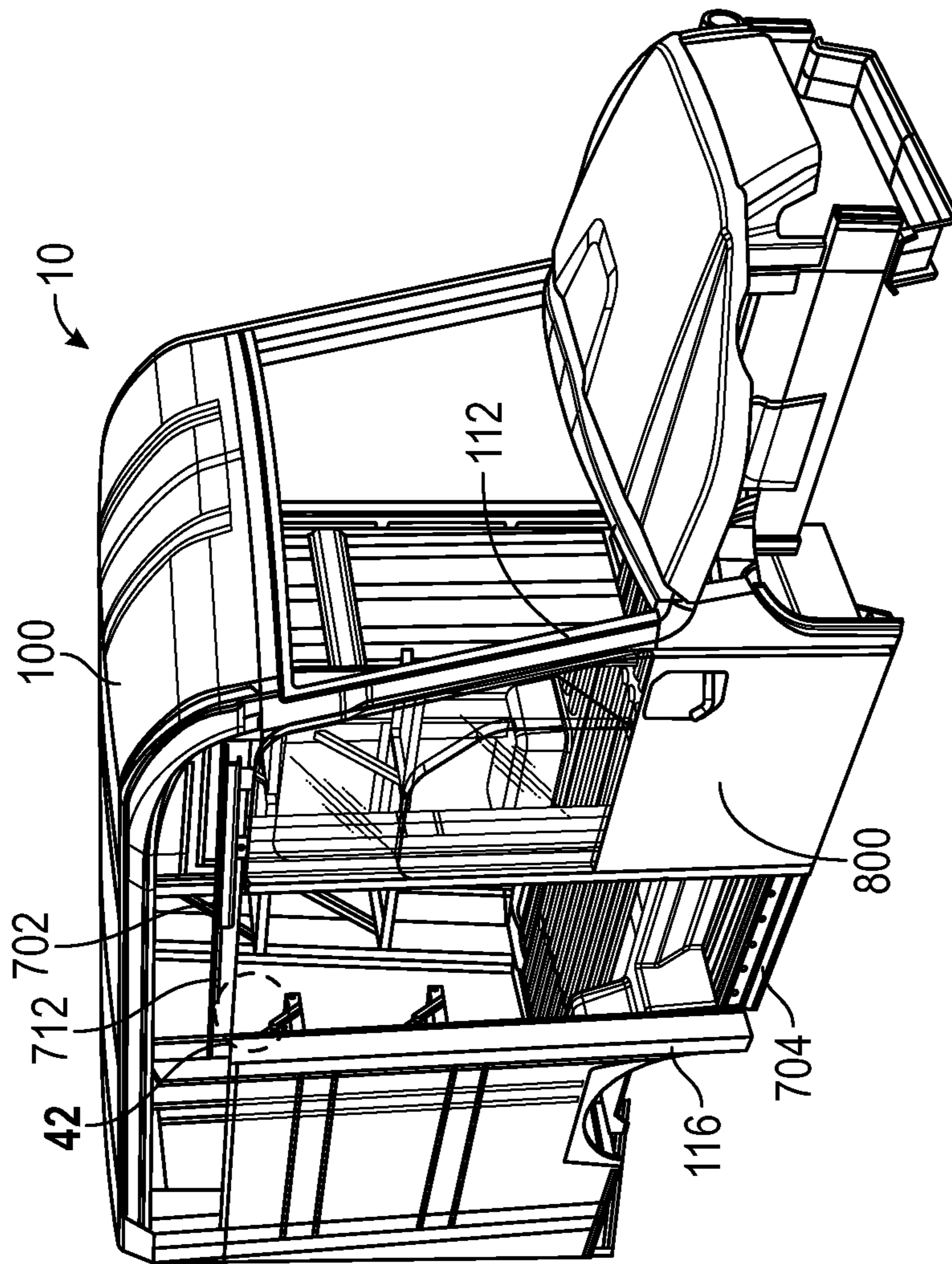


FIG. 41

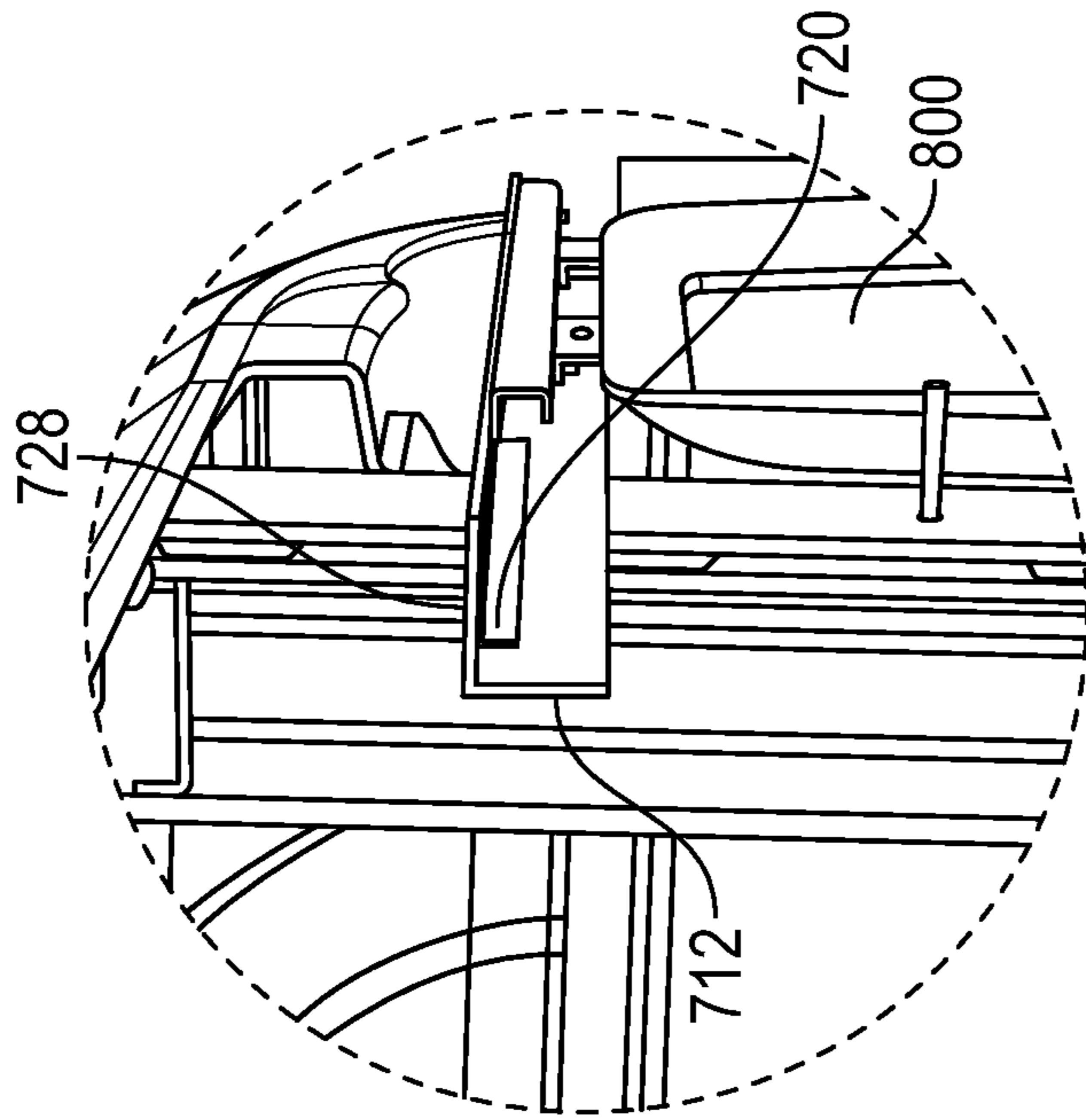


FIG. 42

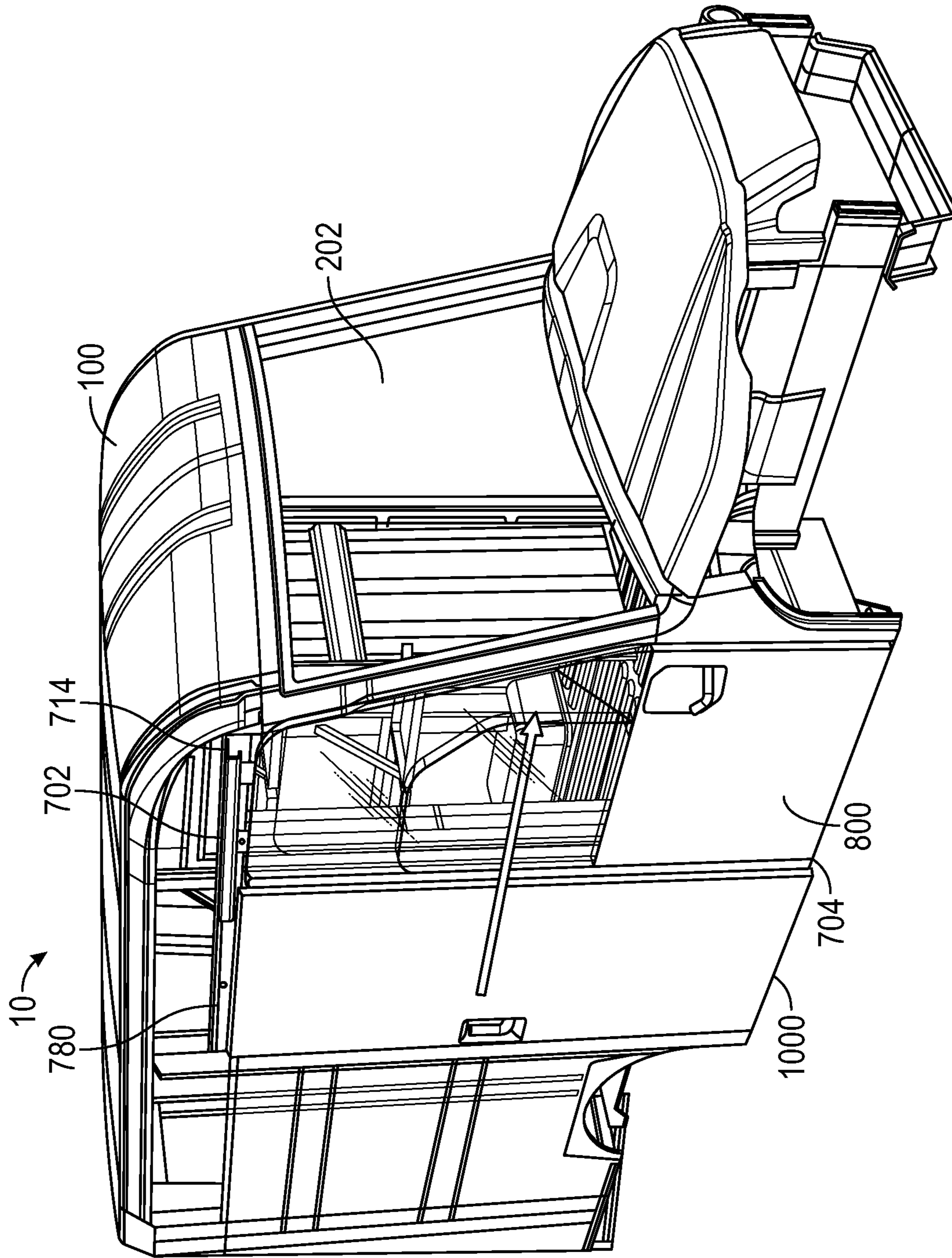


FIG. 43

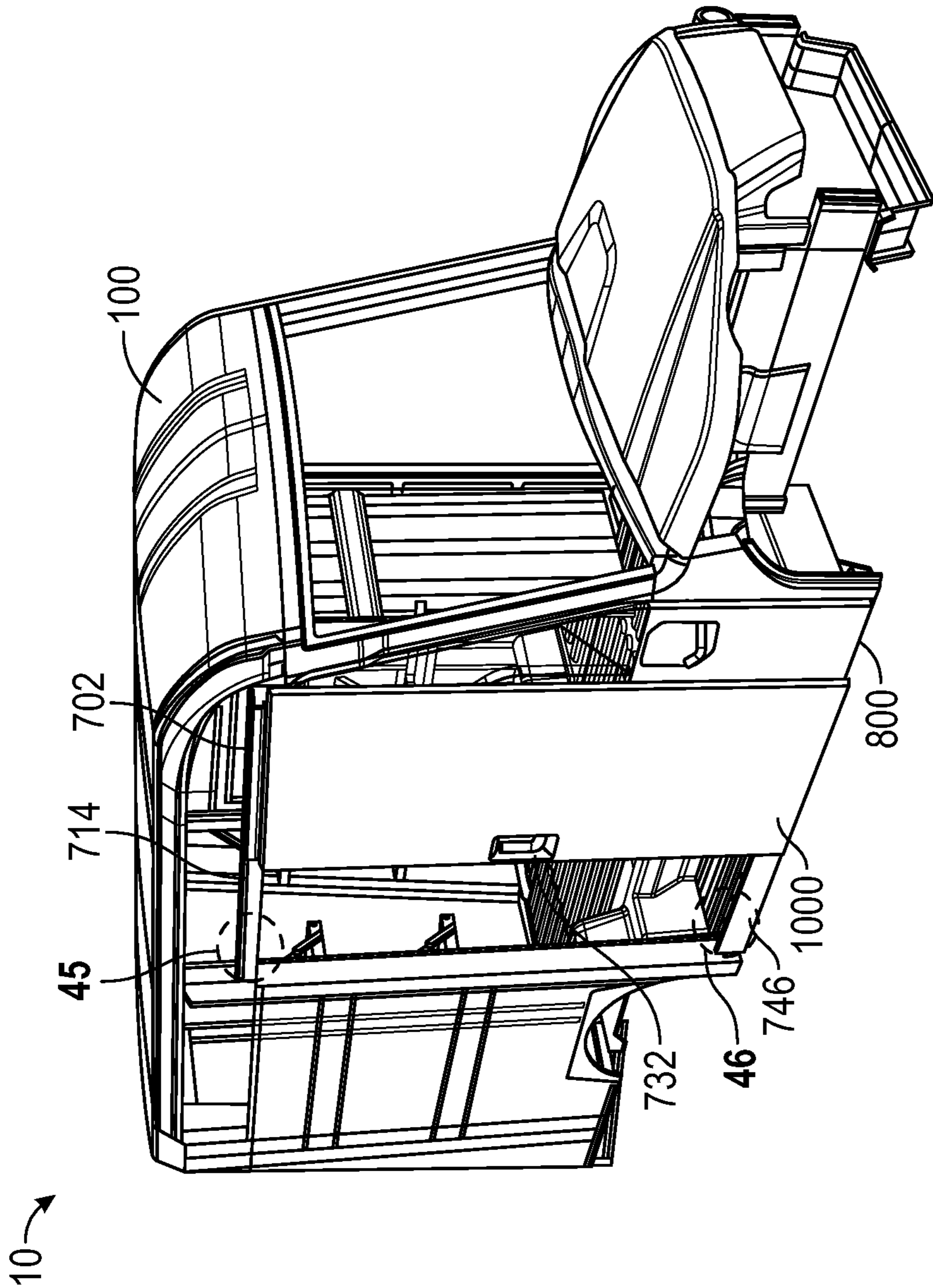


FIG. 44

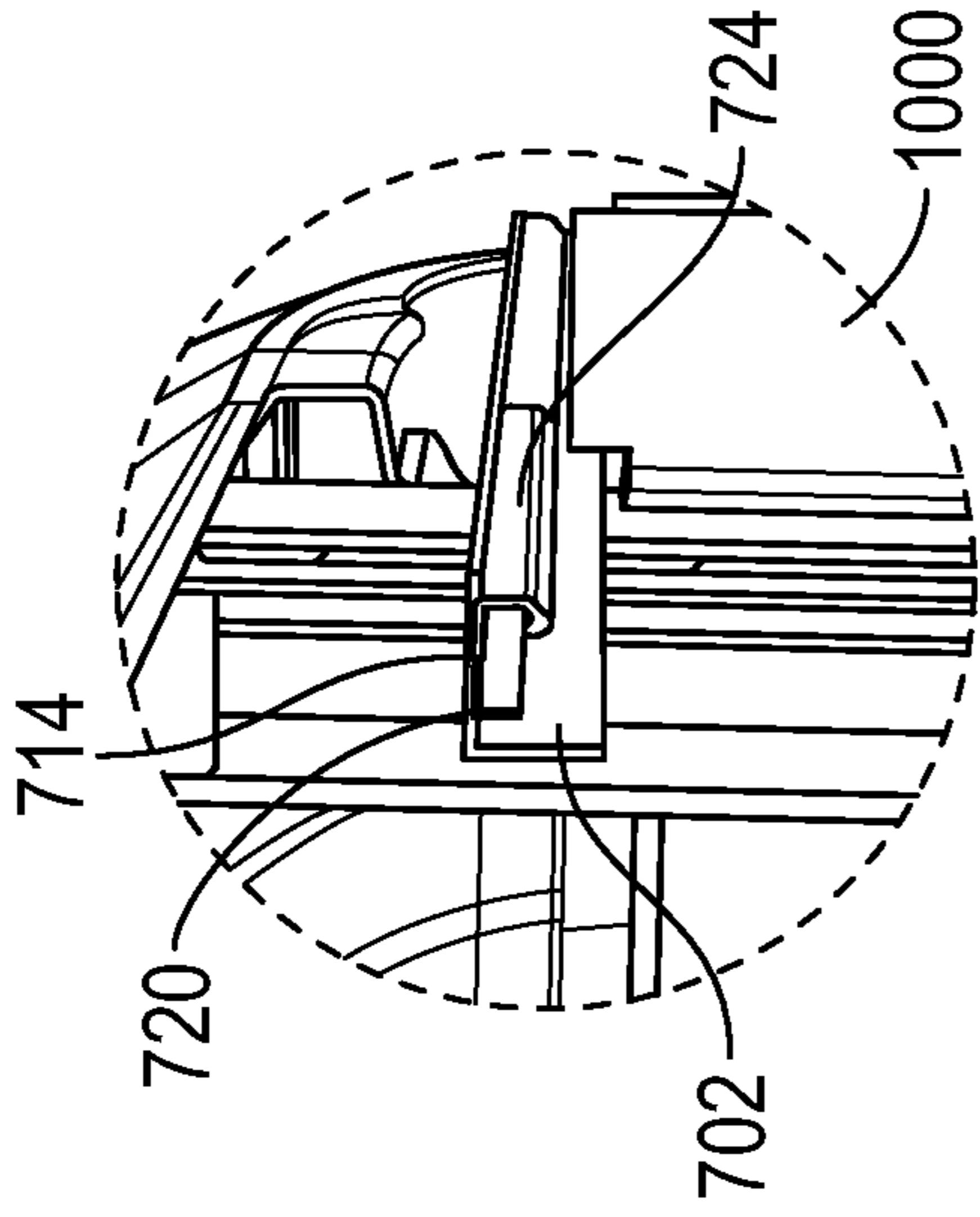


FIG. 45

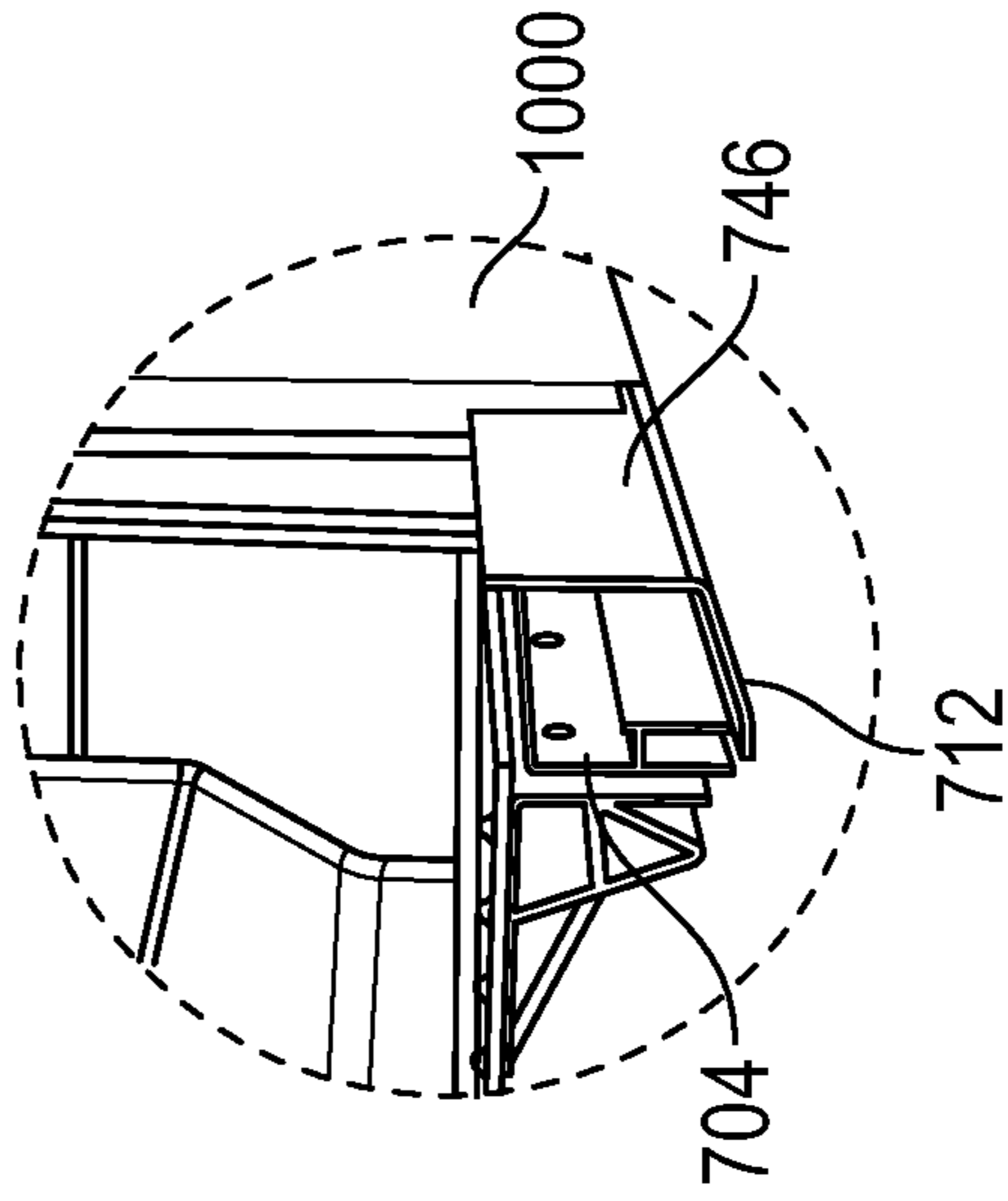


FIG. 46

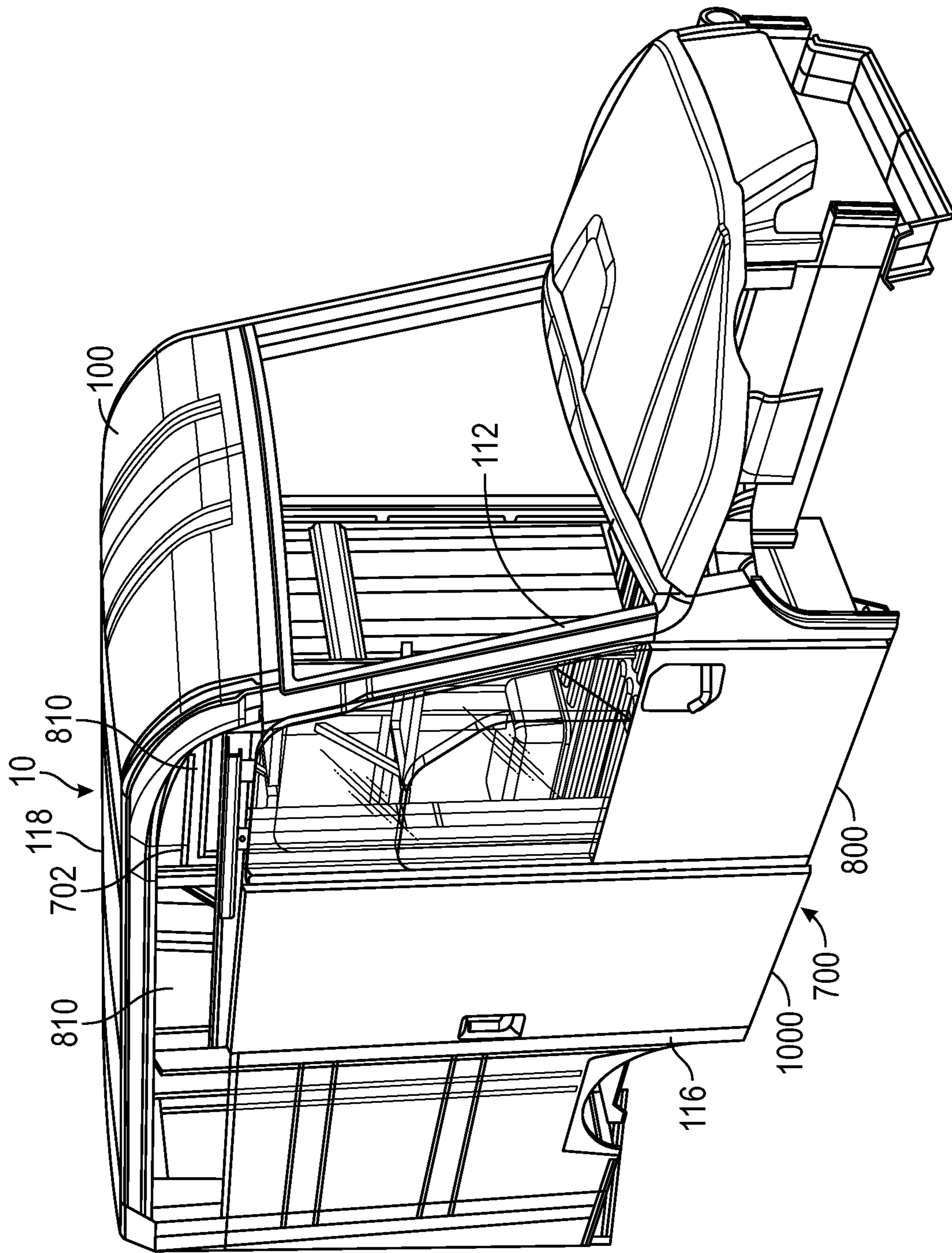


FIG. 47

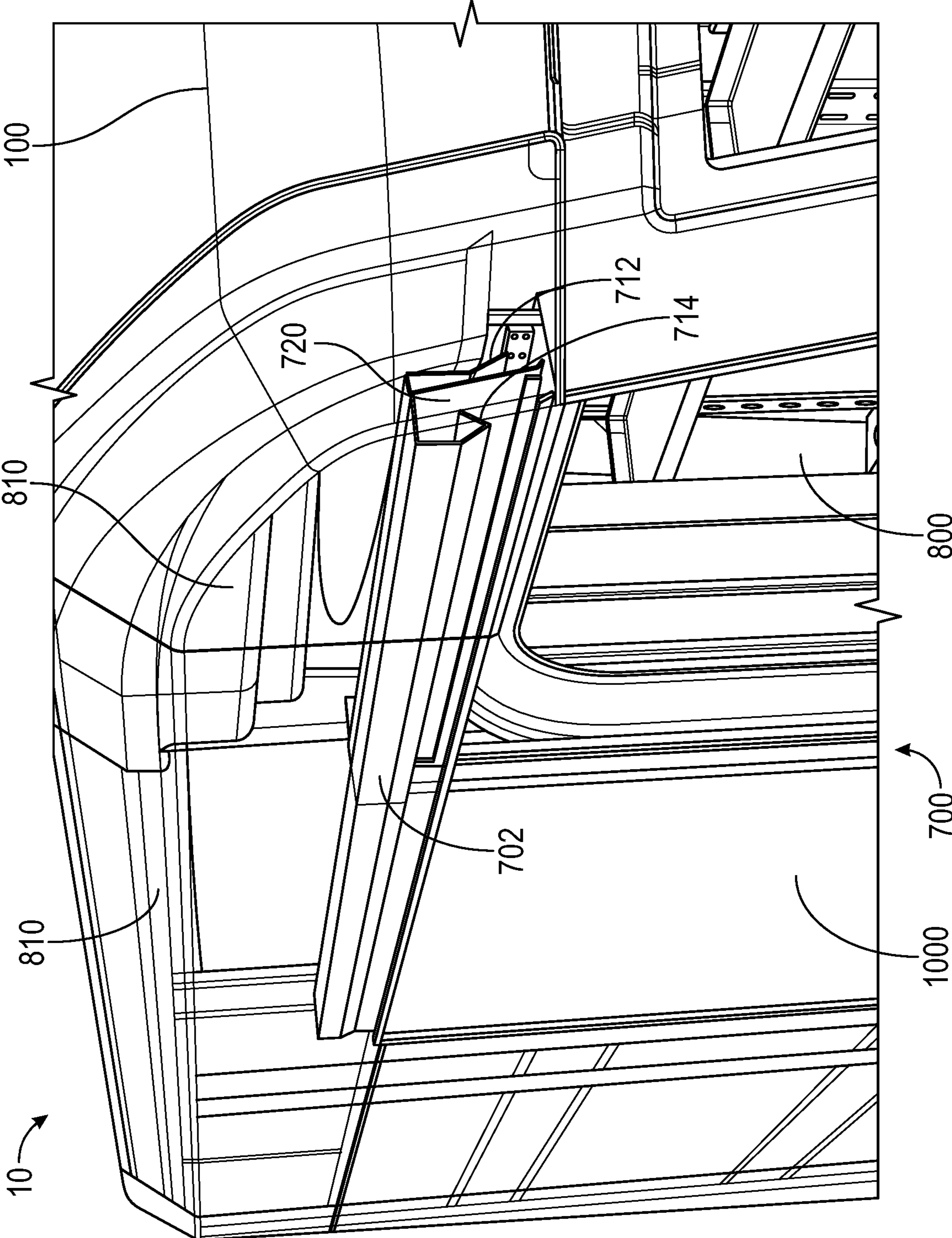


FIG. 48

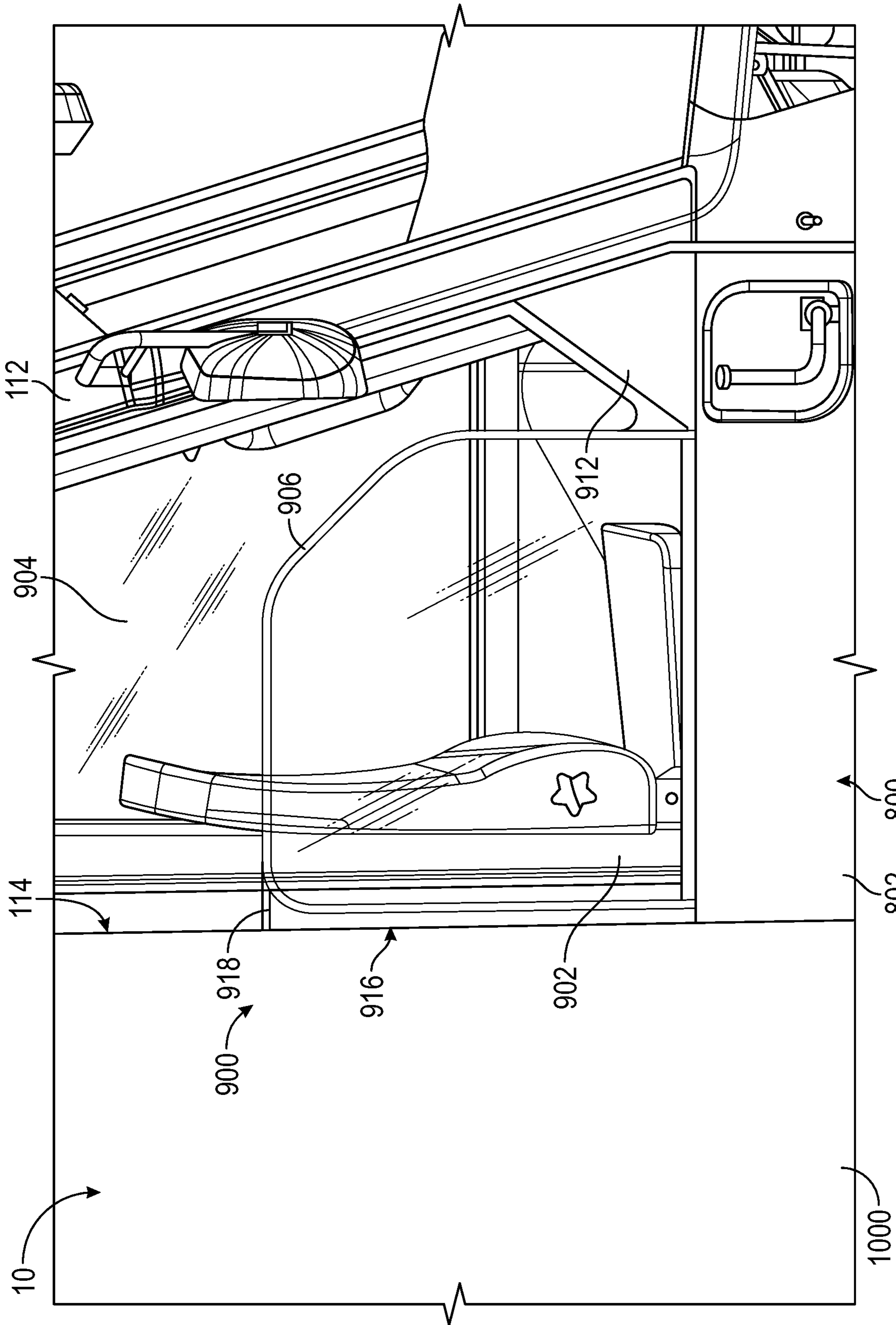


FIG. 49

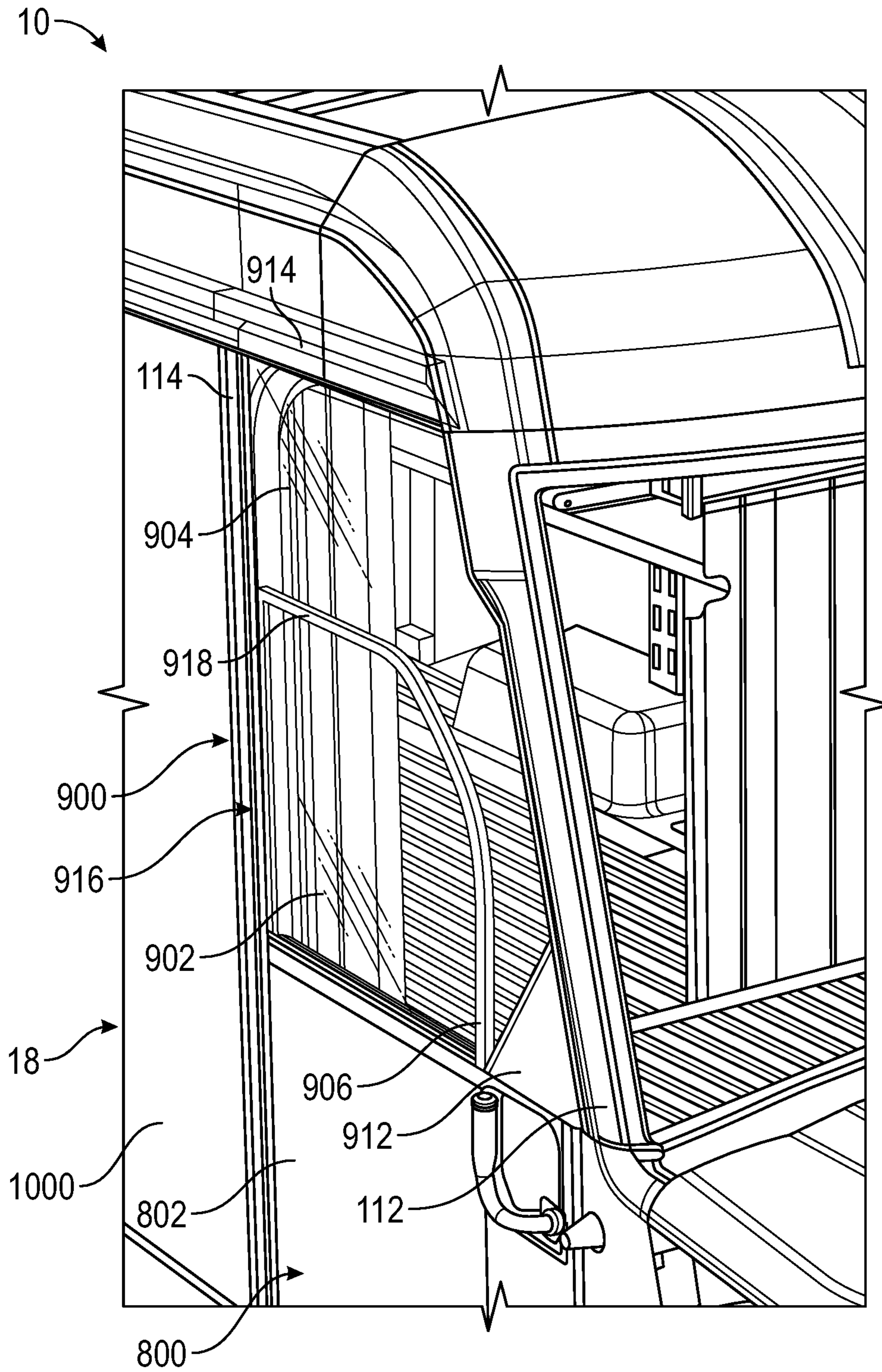


FIG. 50

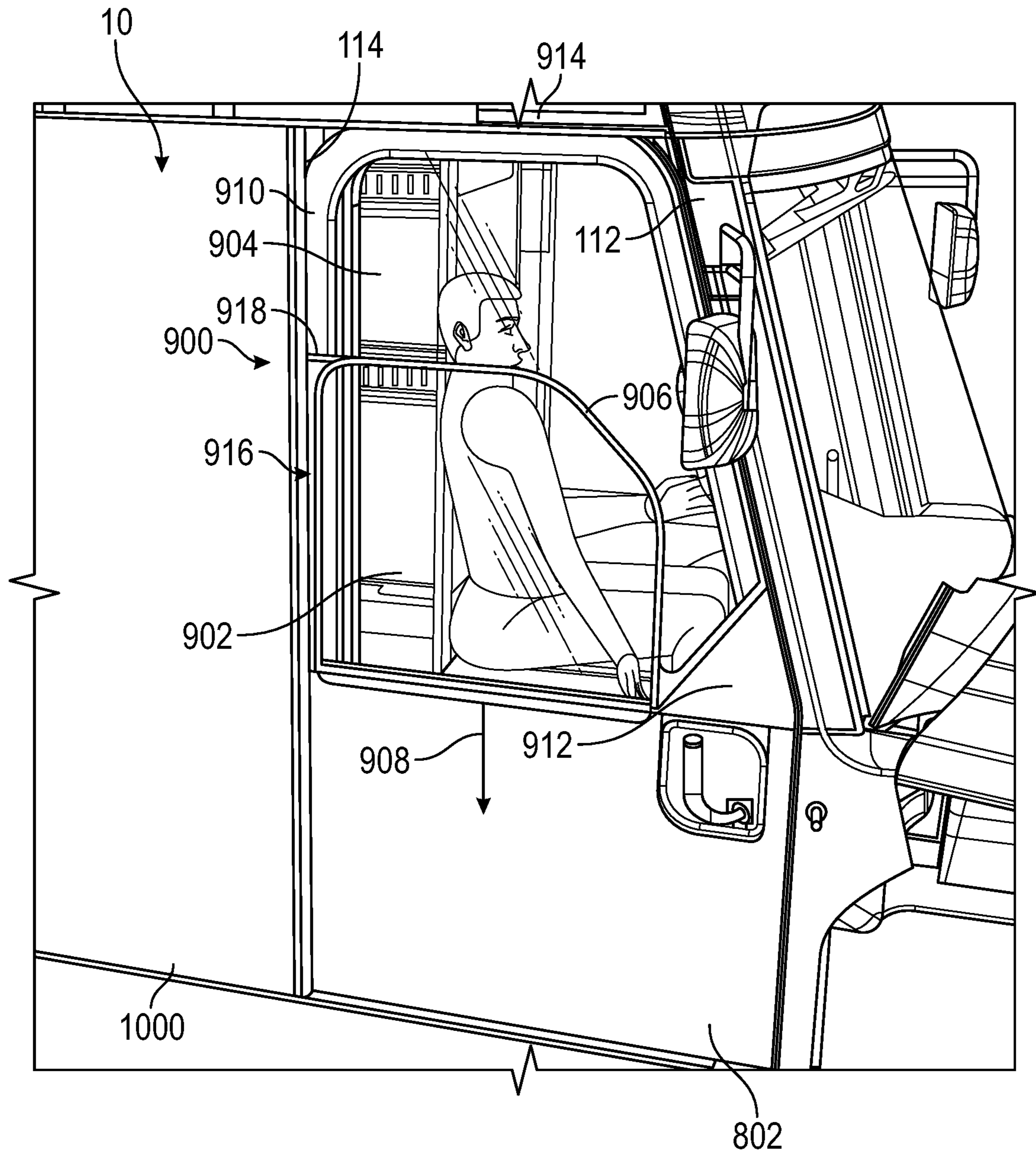


FIG. 51

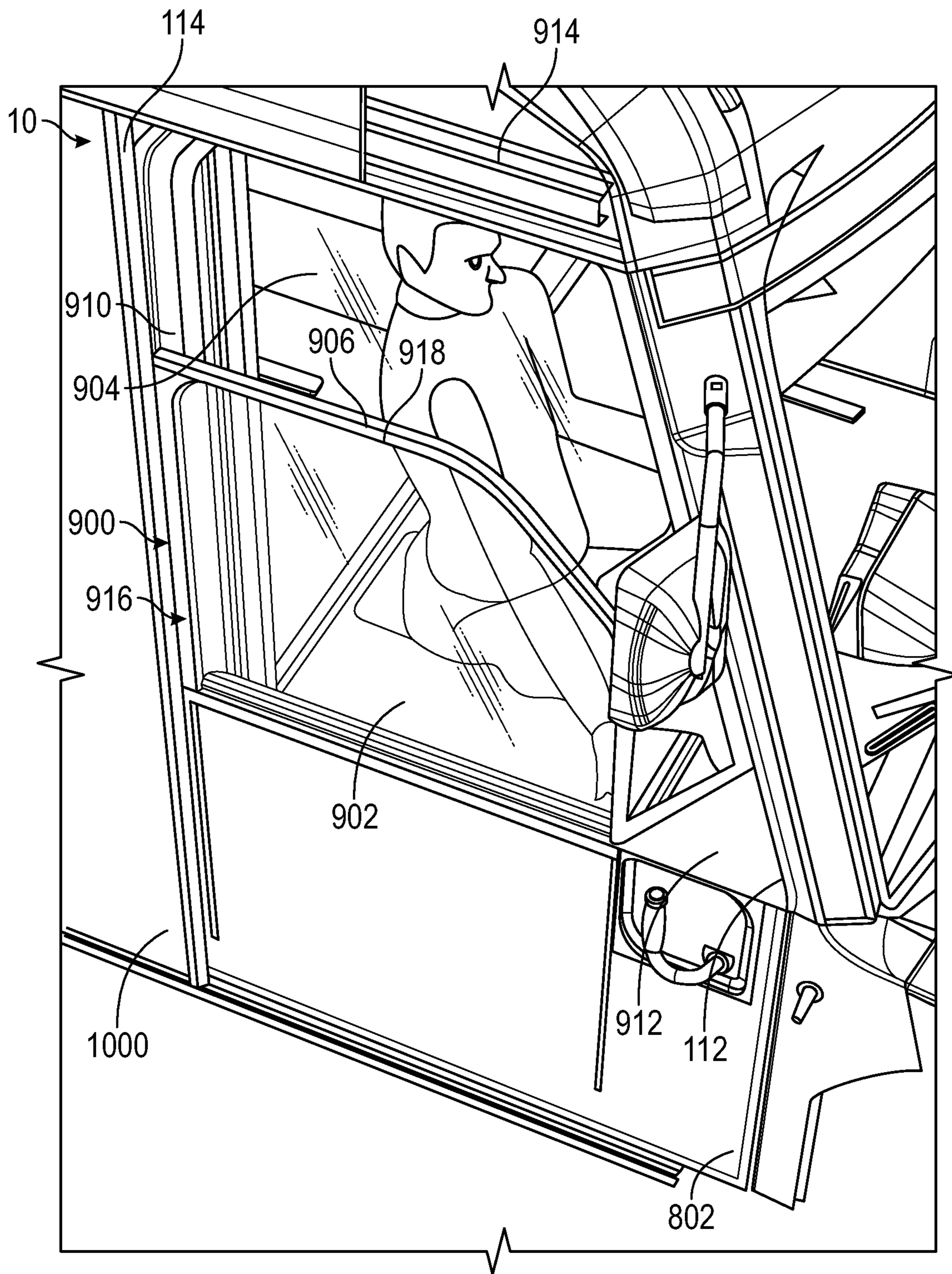


FIG. 52

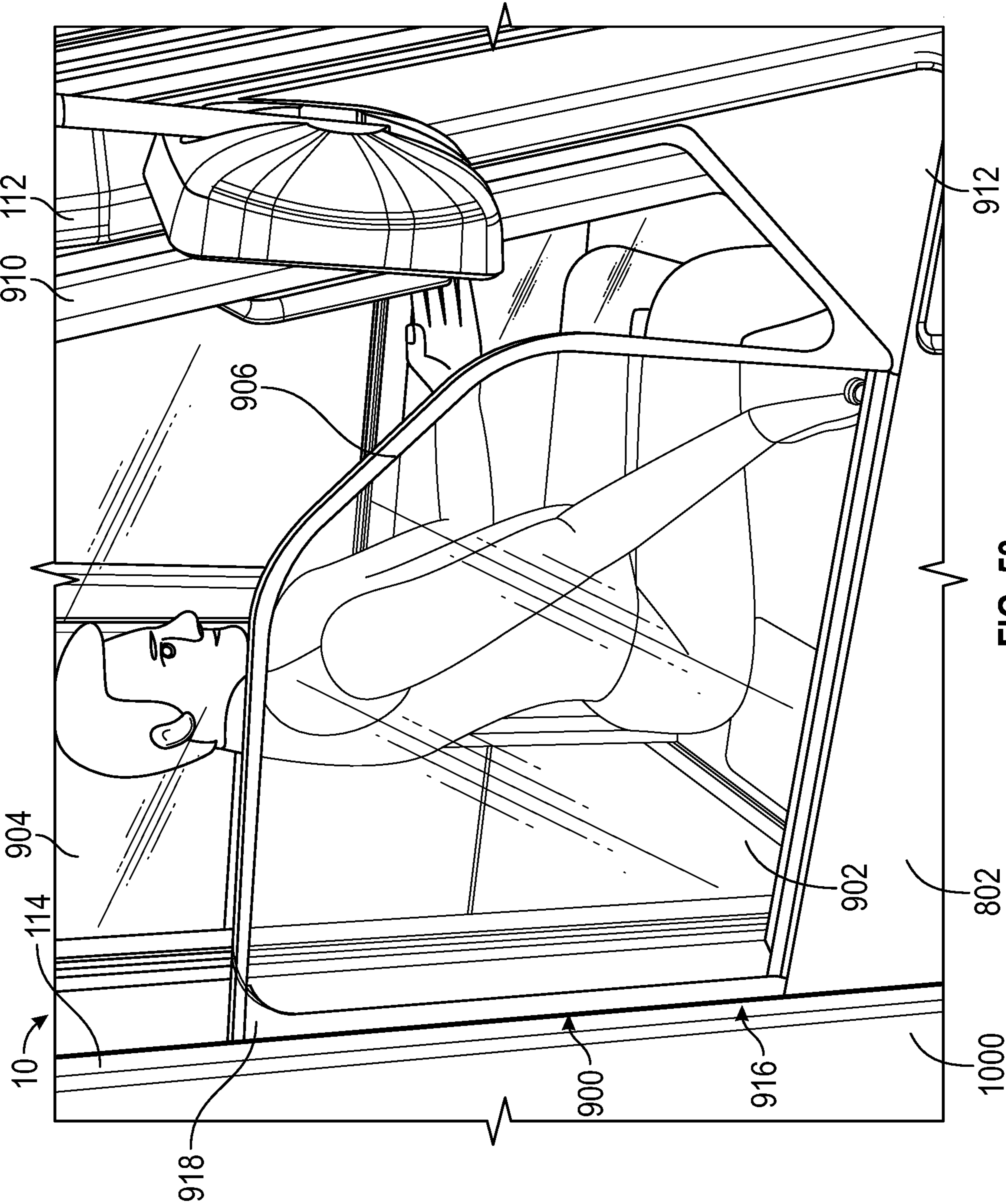


FIG. 53

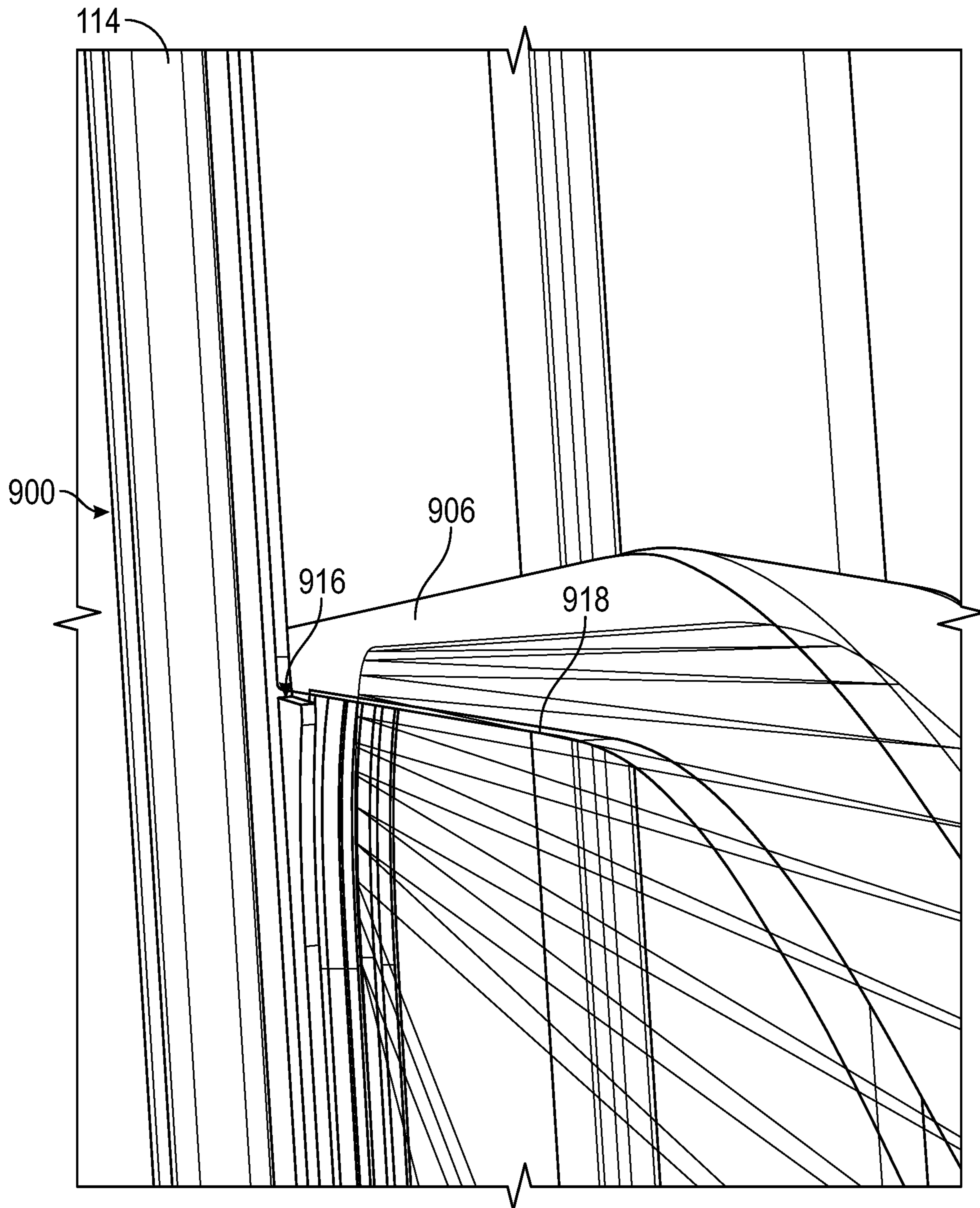


FIG. 54

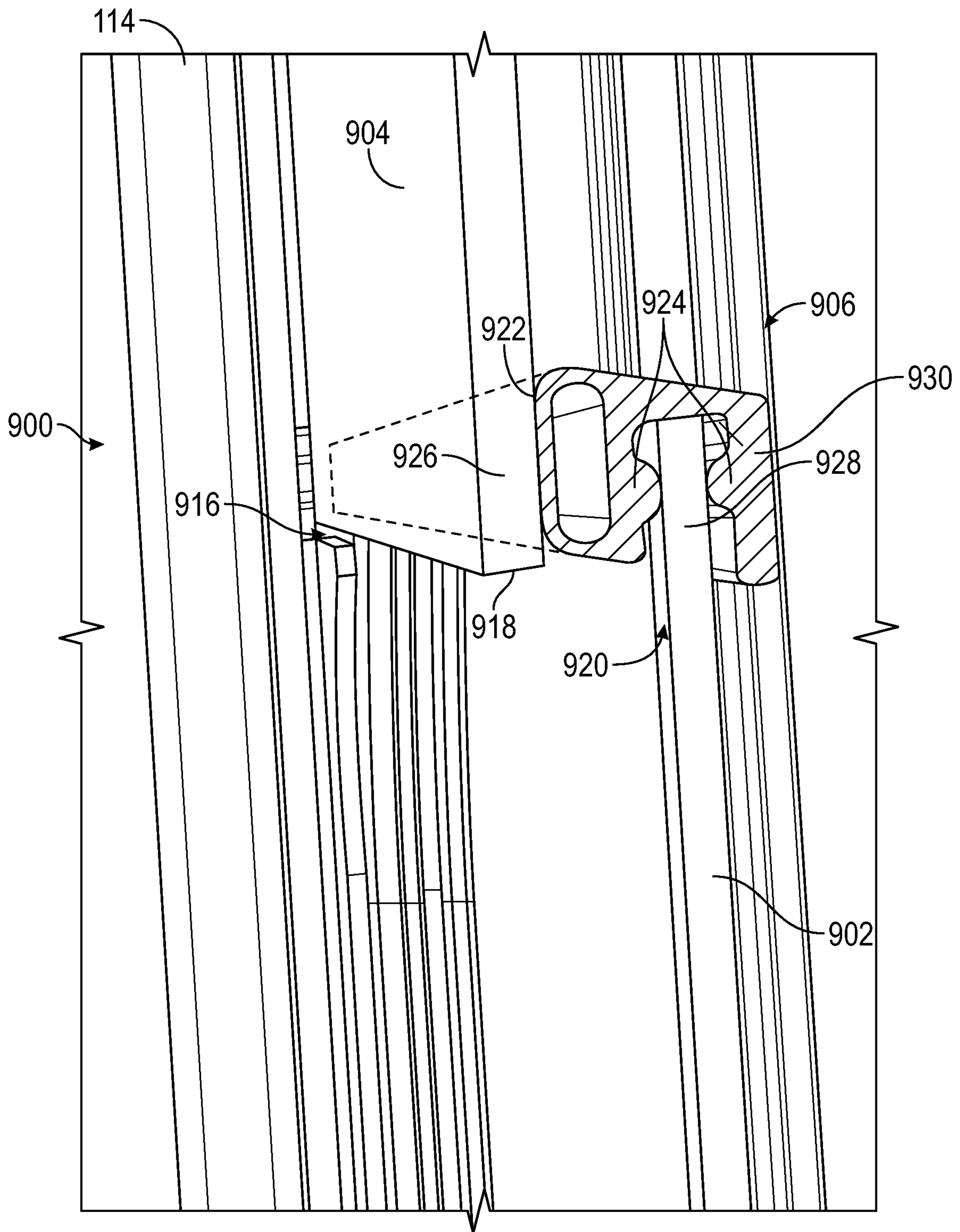


FIG. 55

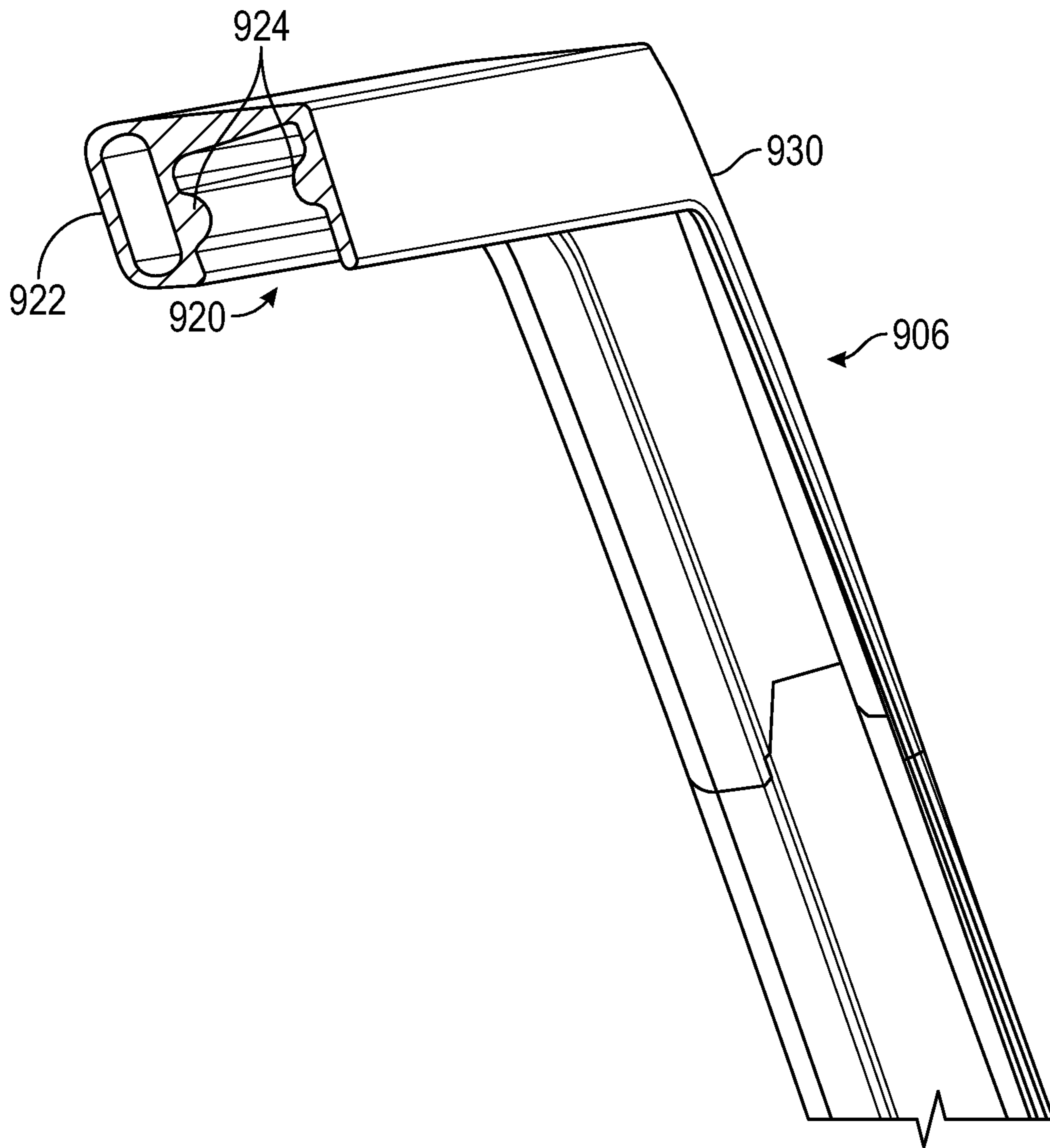


FIG. 56

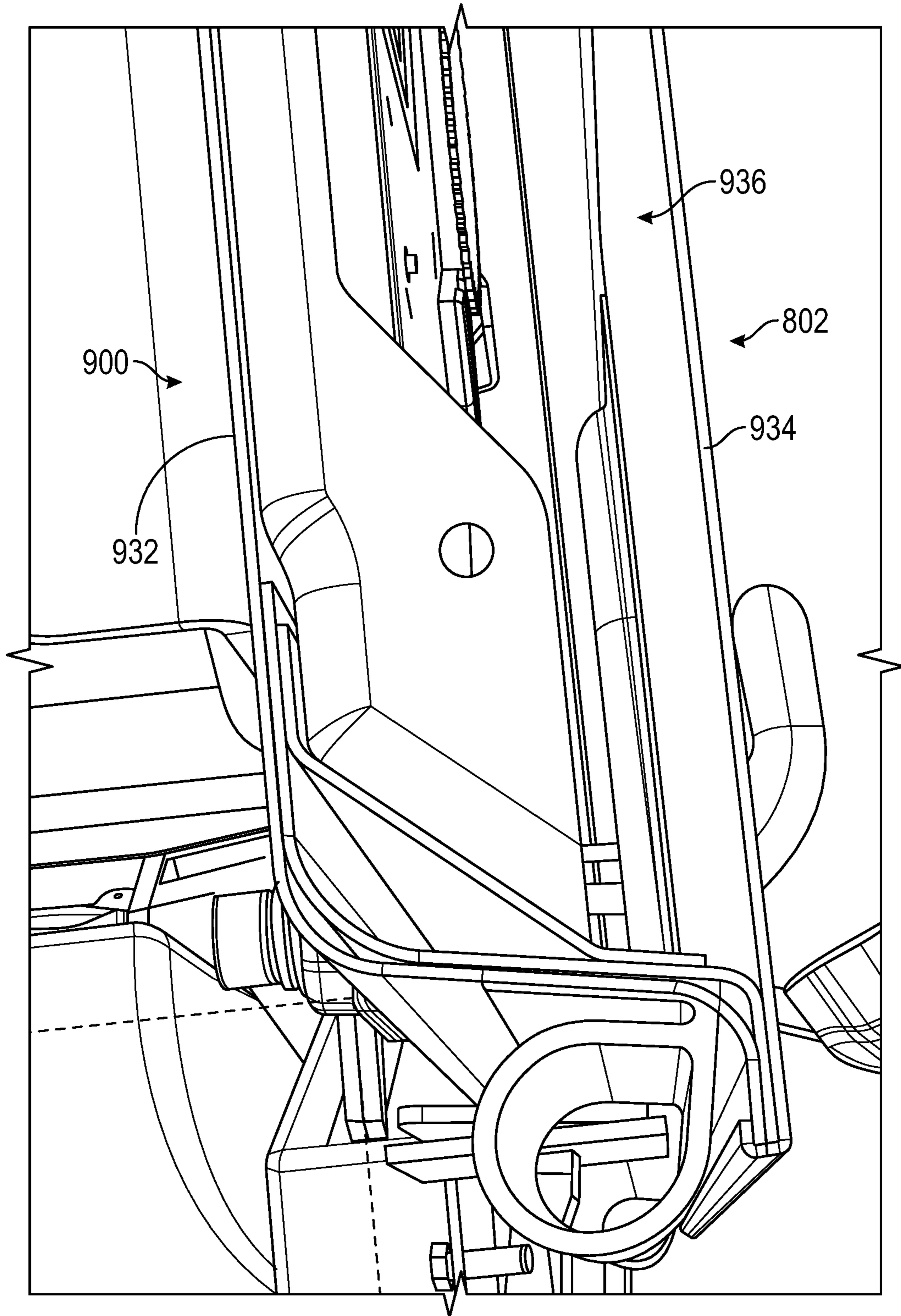


FIG. 57

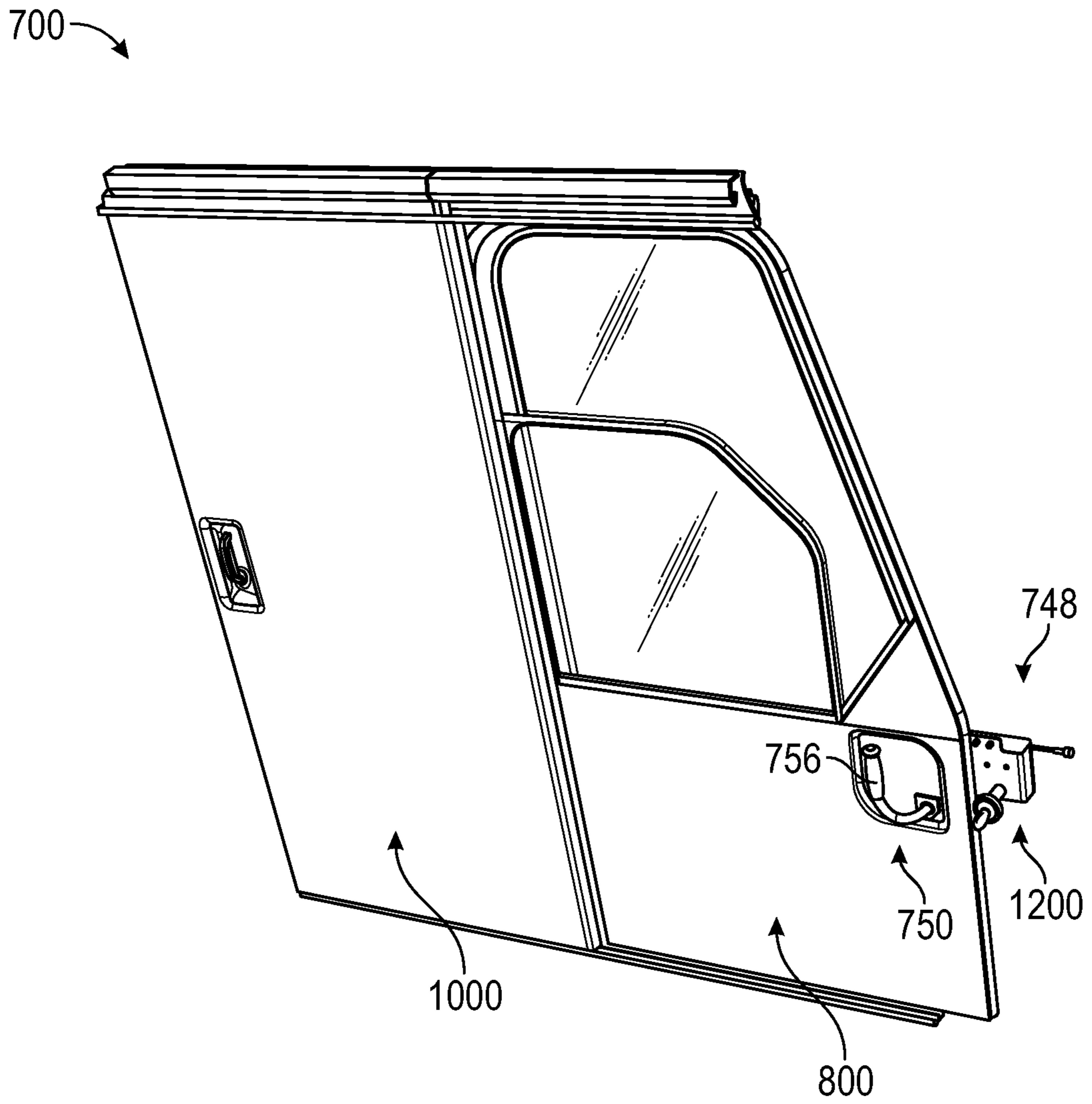


FIG. 58

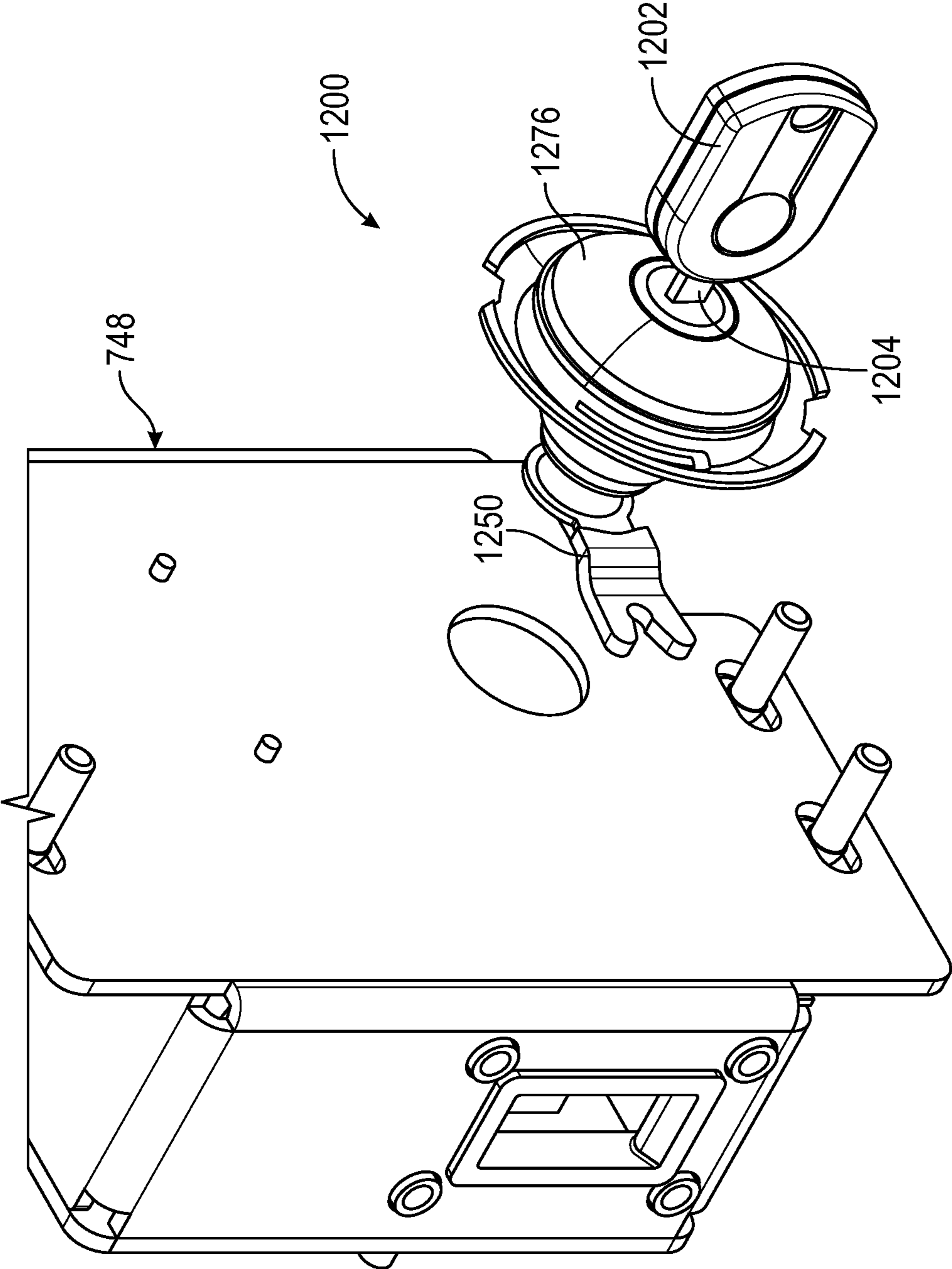


FIG. 59

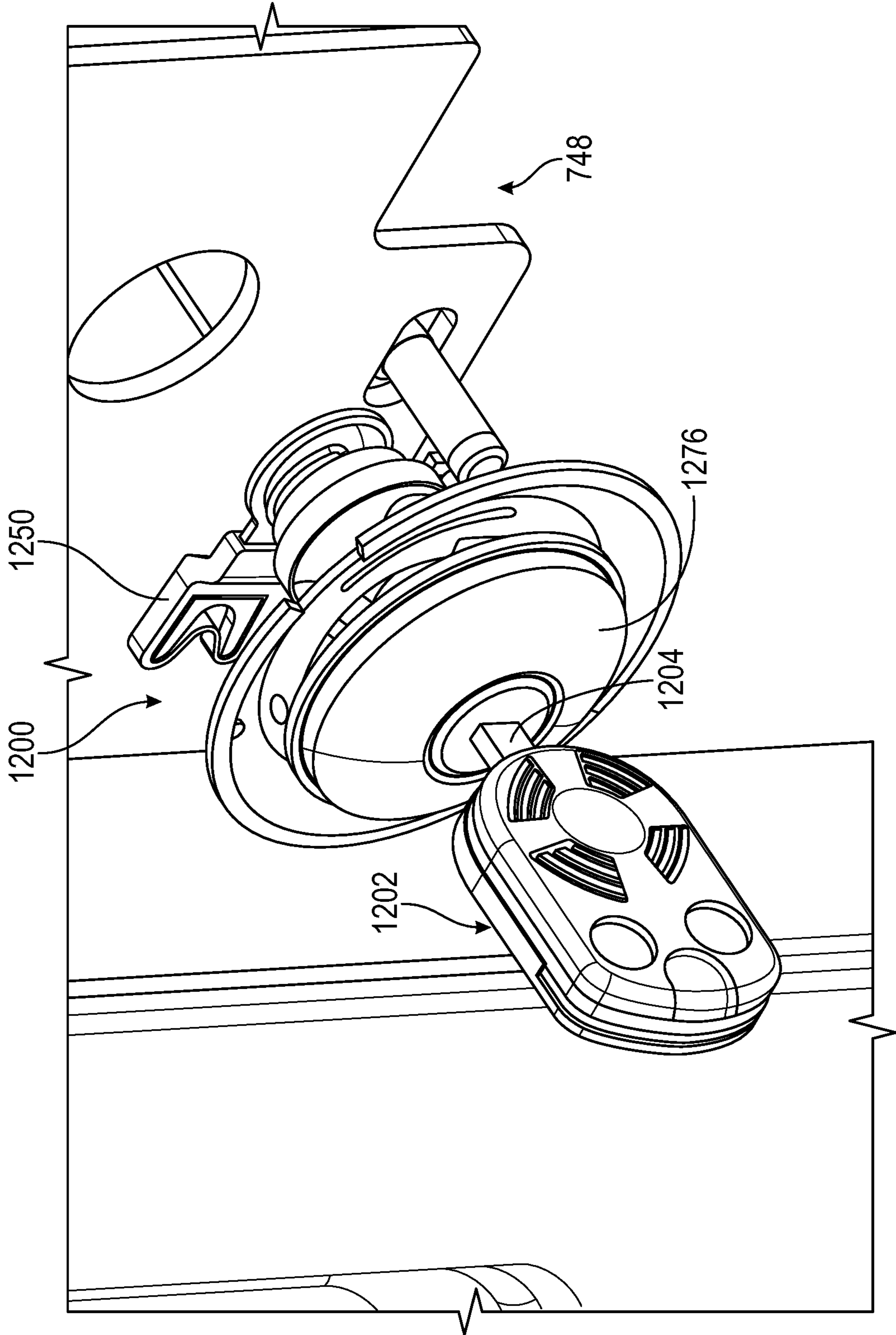


FIG. 60

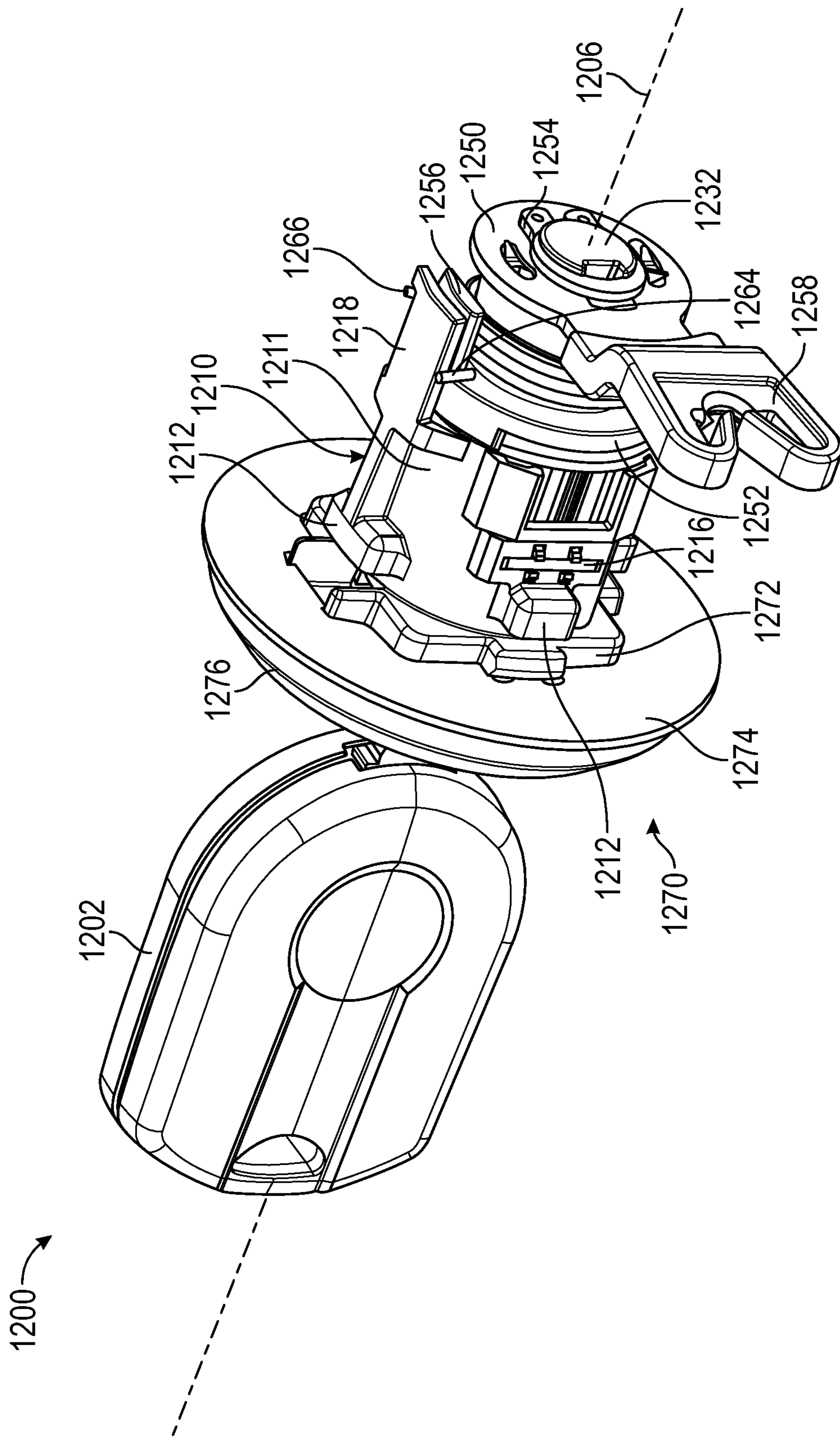


FIG. 61

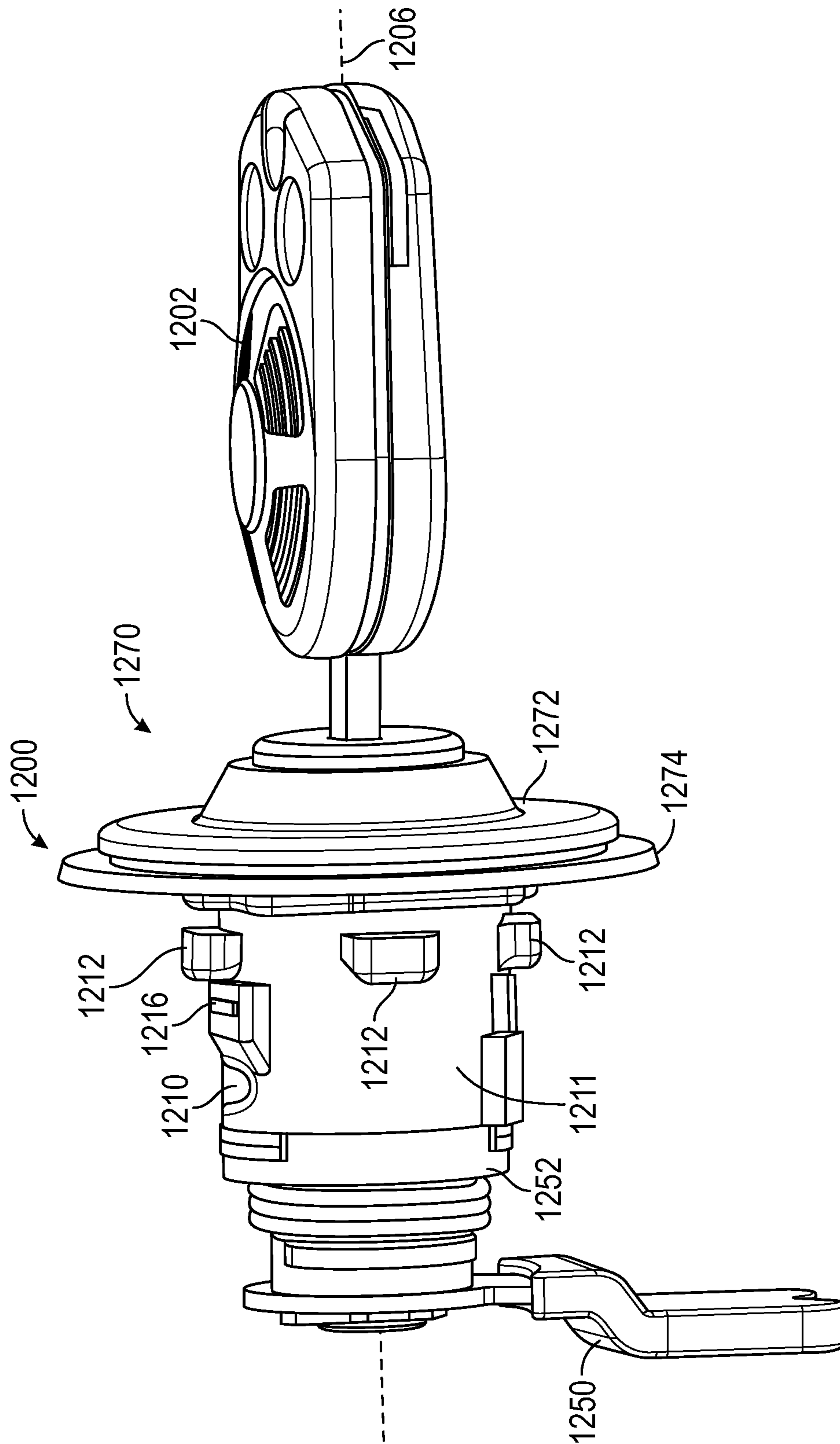


FIG. 62

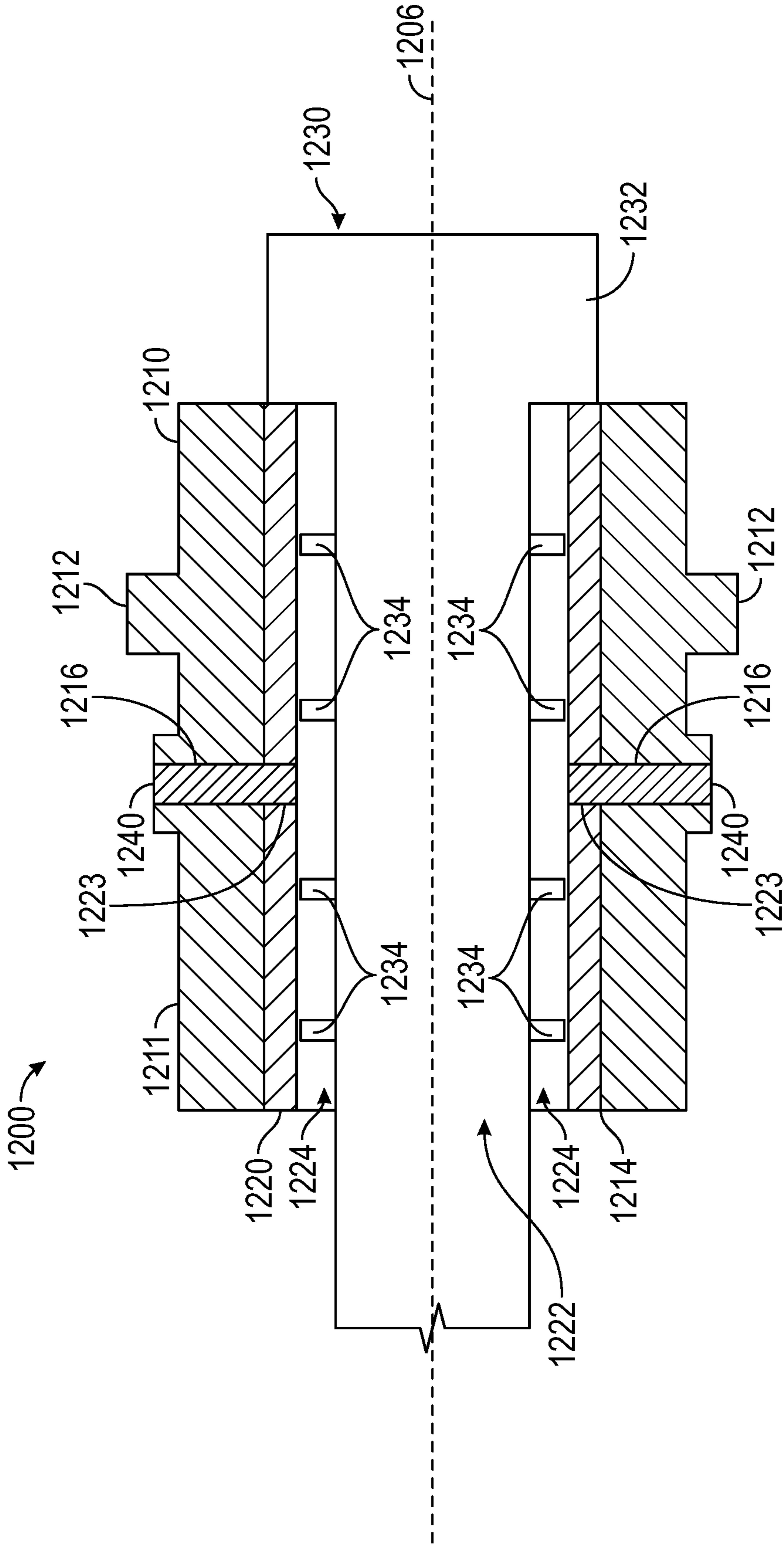


FIG. 63

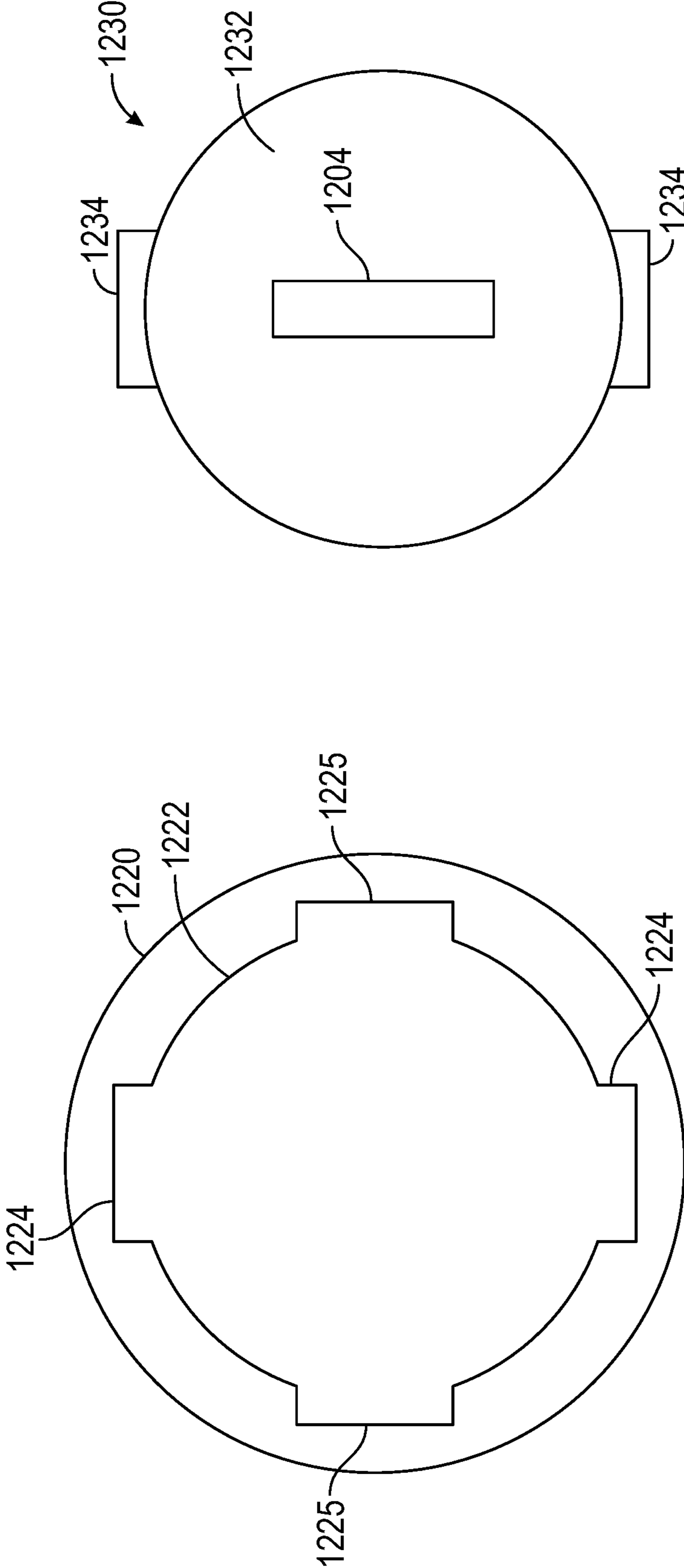


FIG. 65

FIG. 64

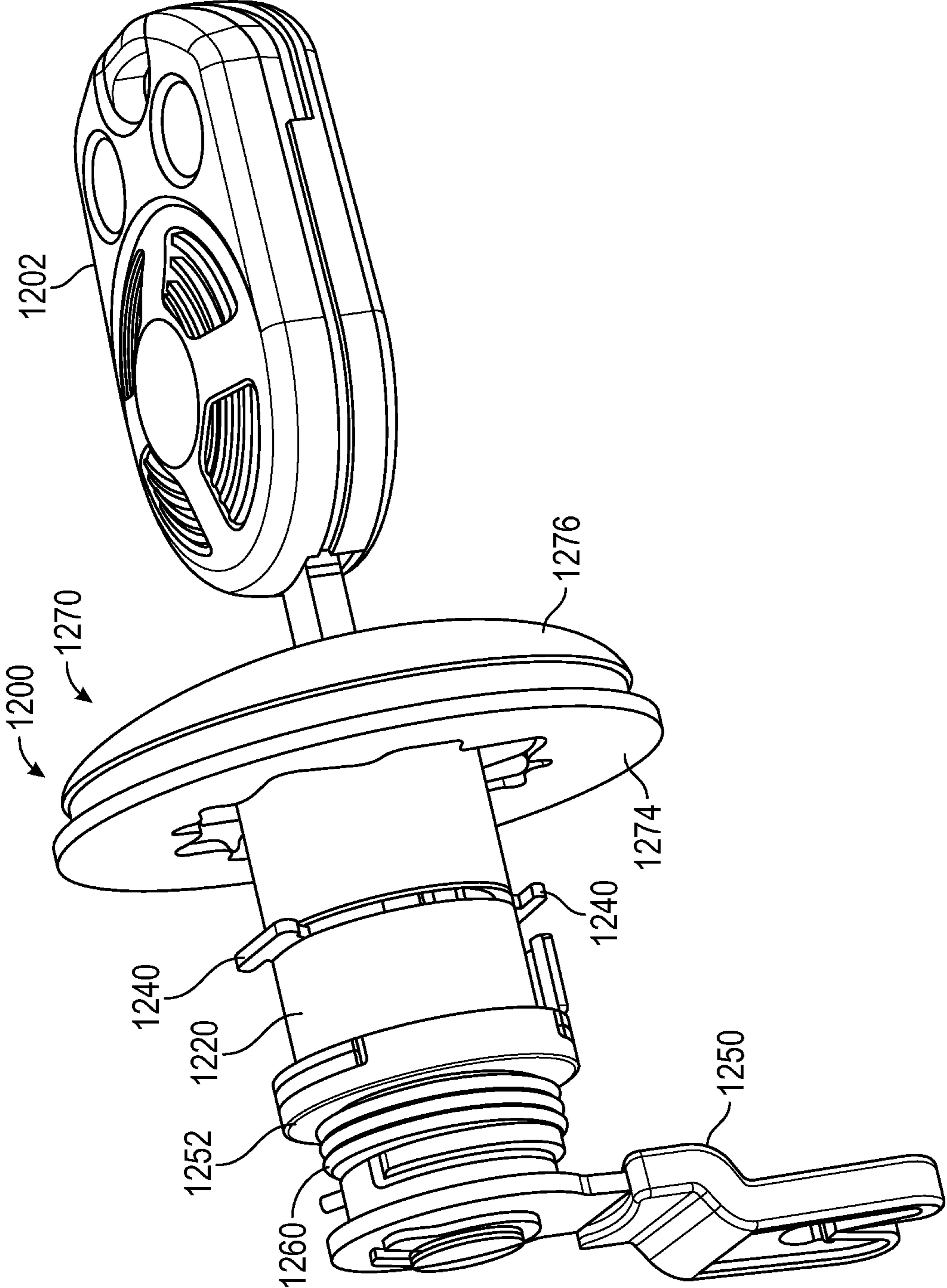


FIG. 66

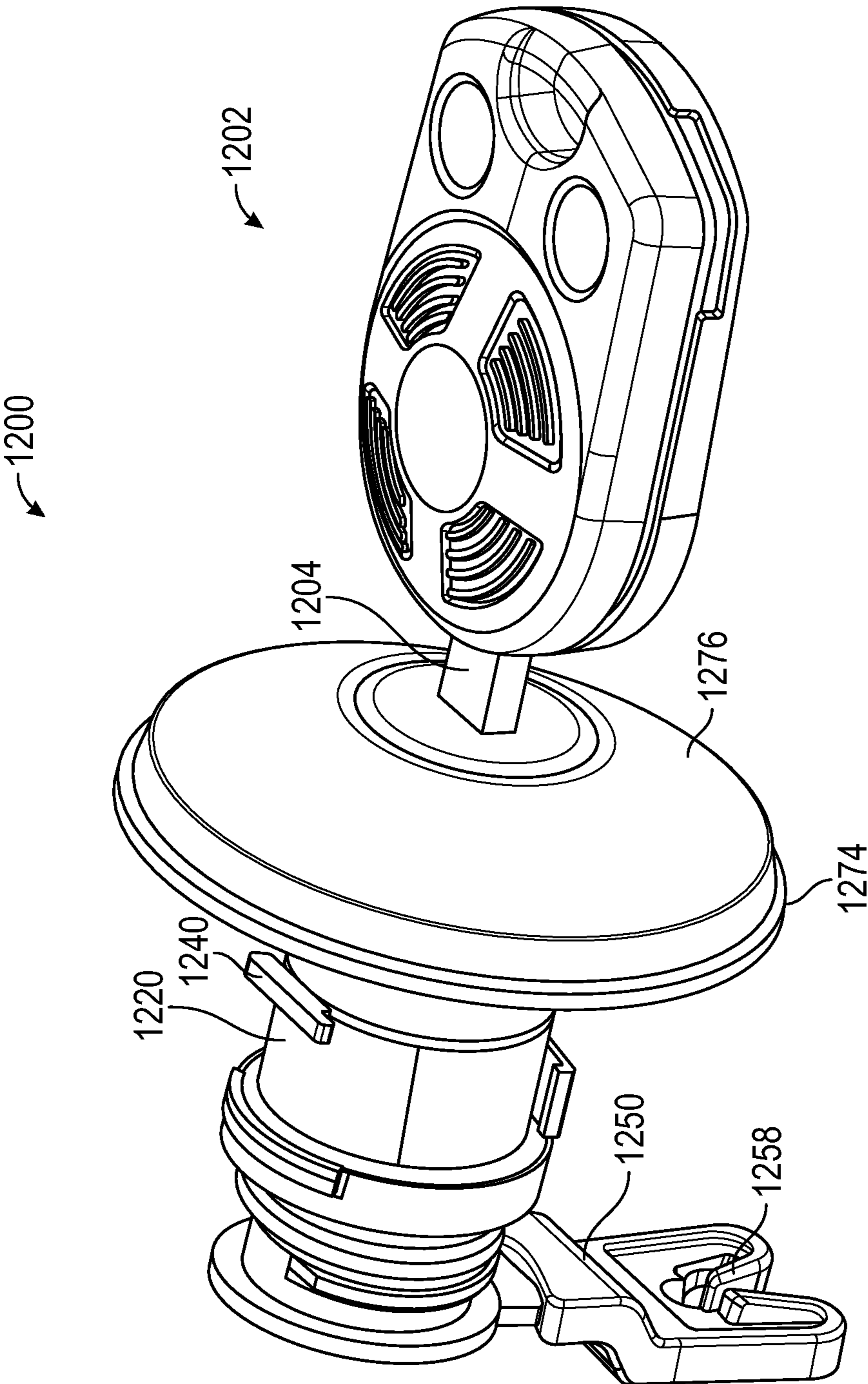


FIG. 67

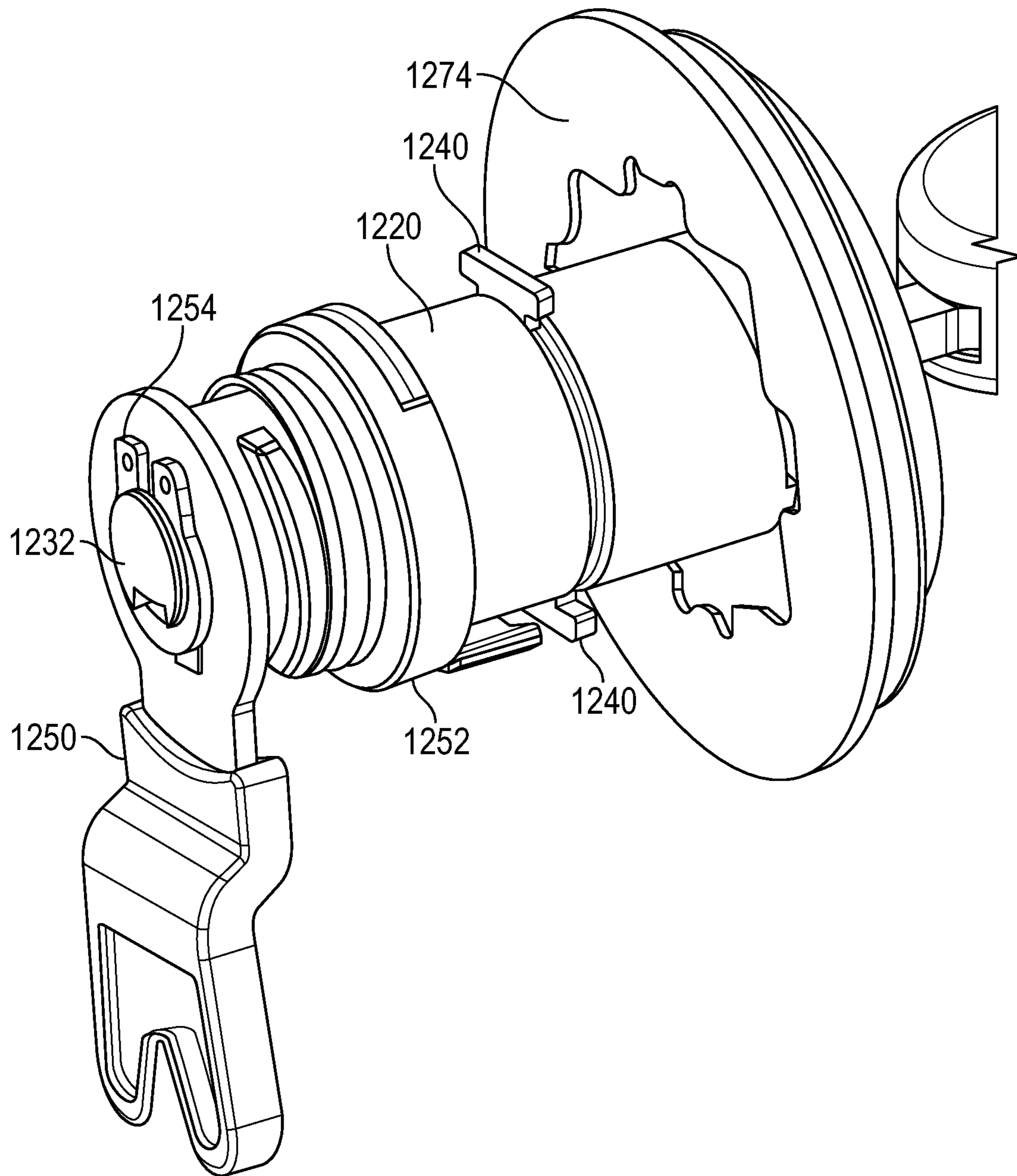


FIG. 68

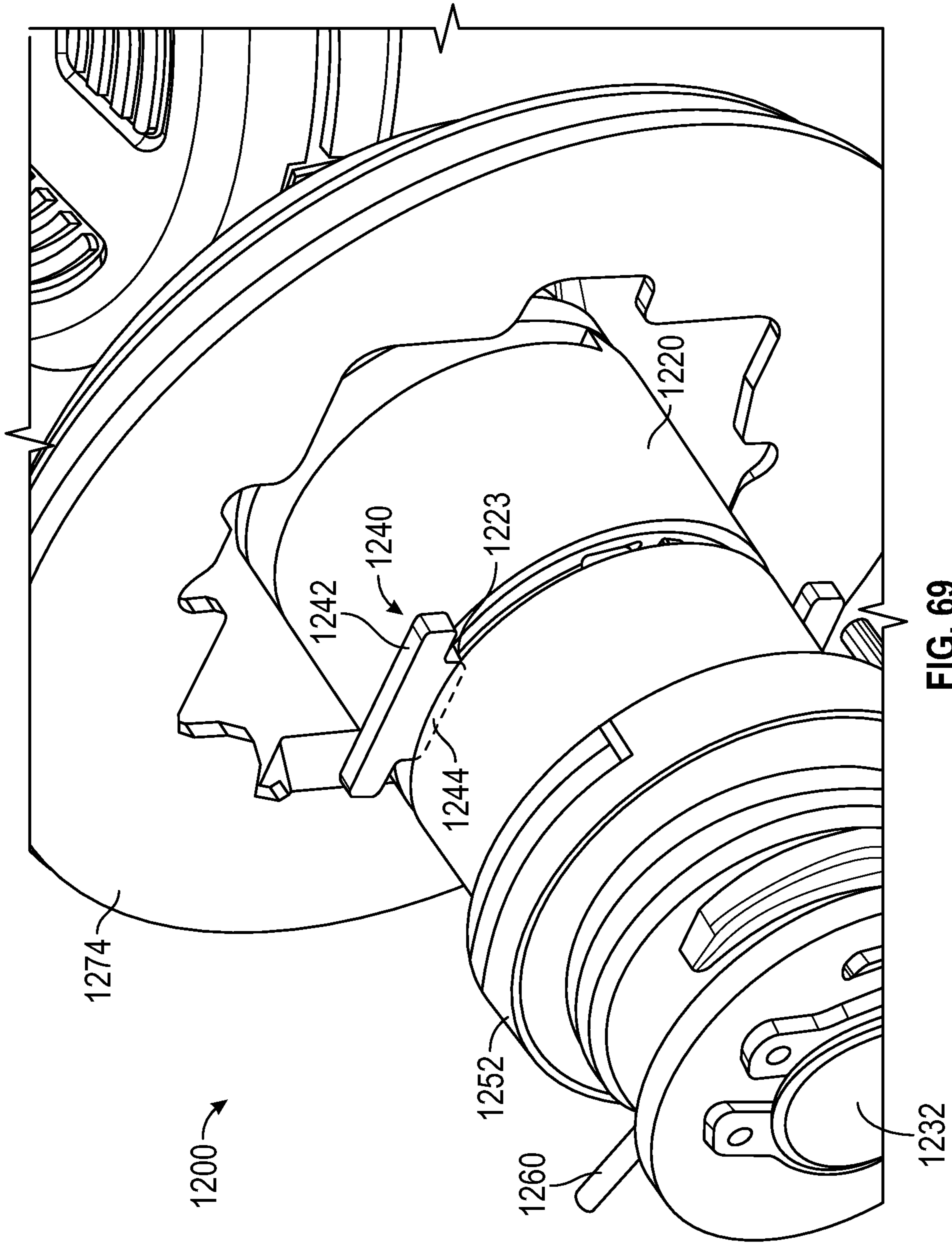


FIG. 69

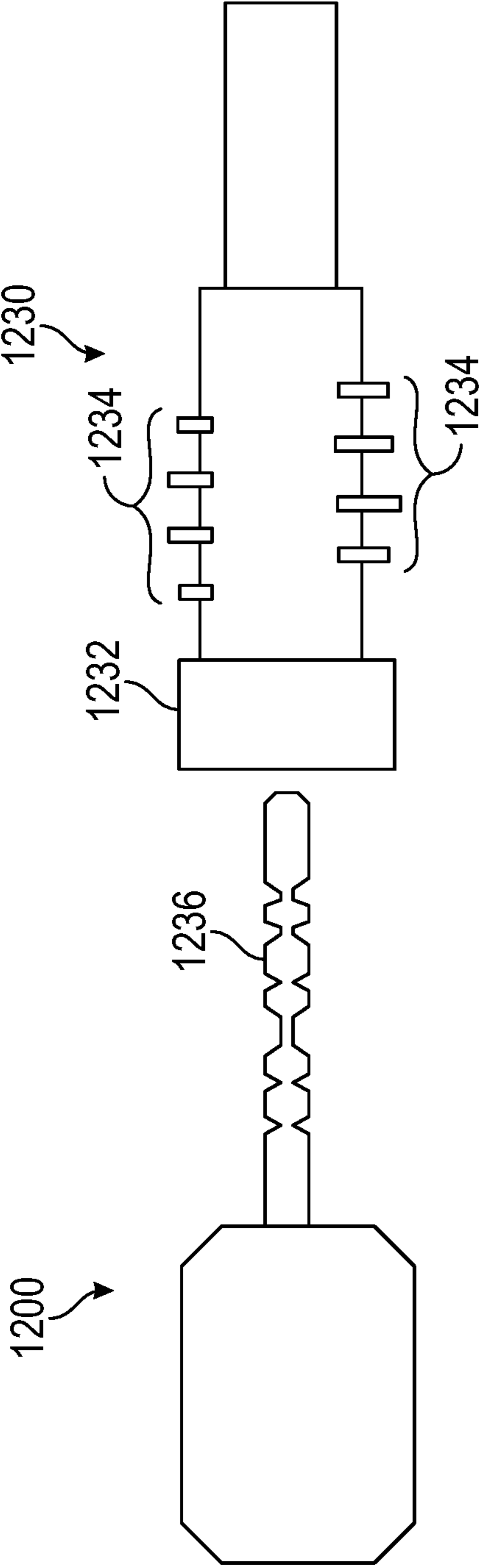


FIG. 70

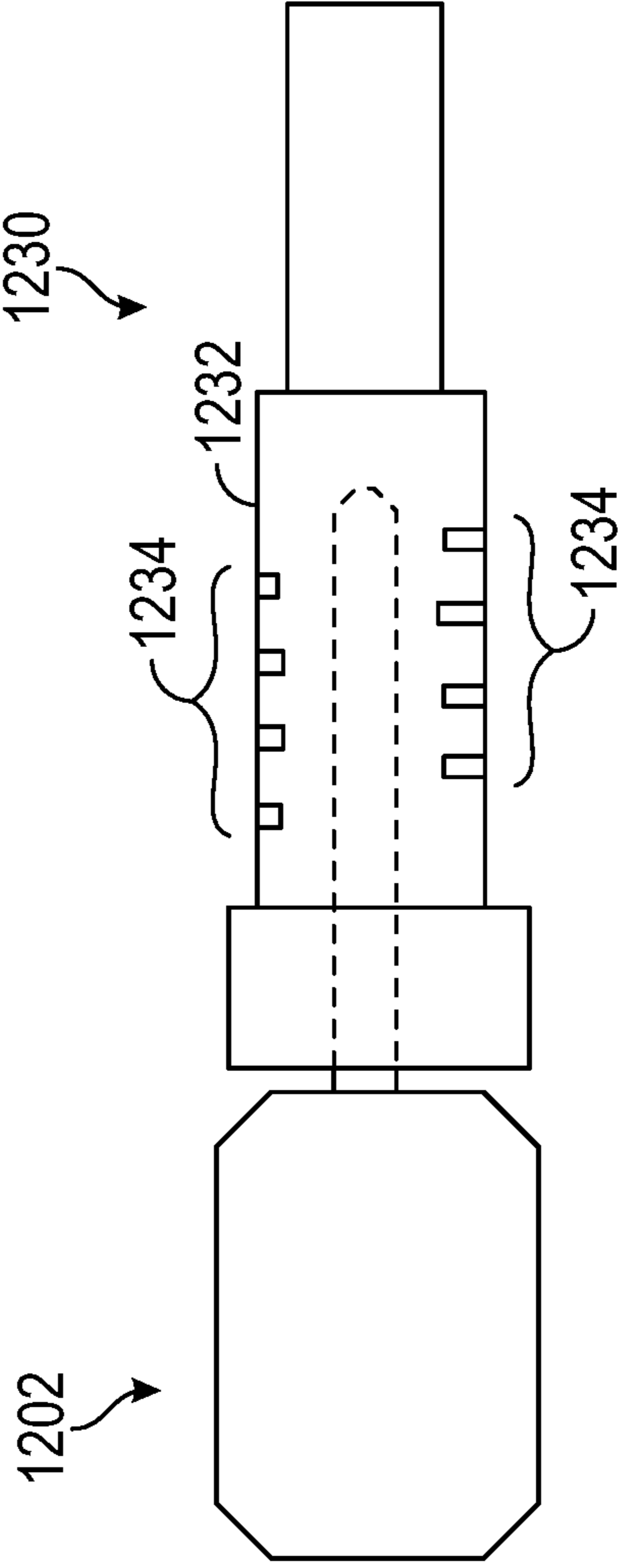


FIG. 71

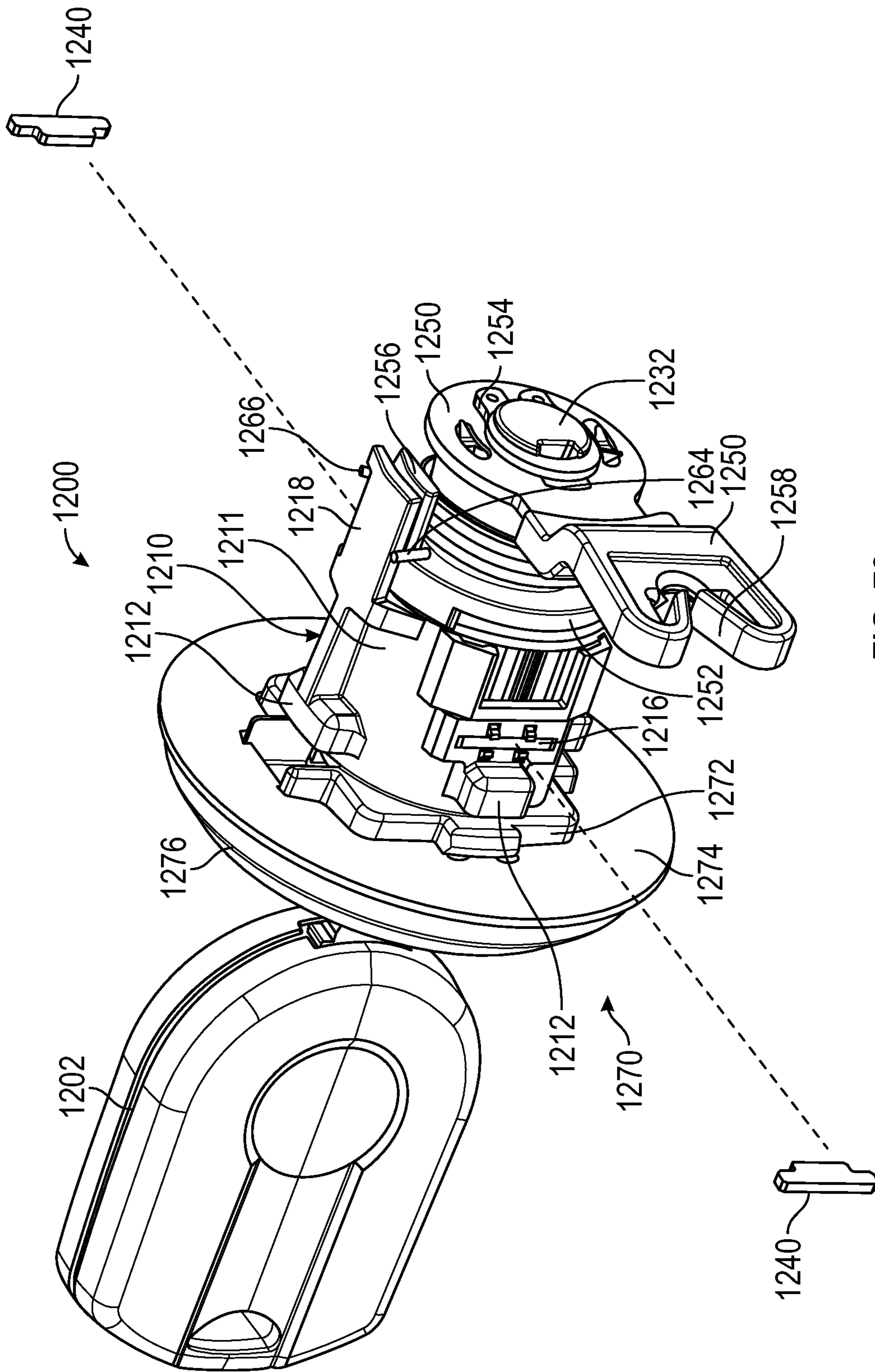


FIG. 72

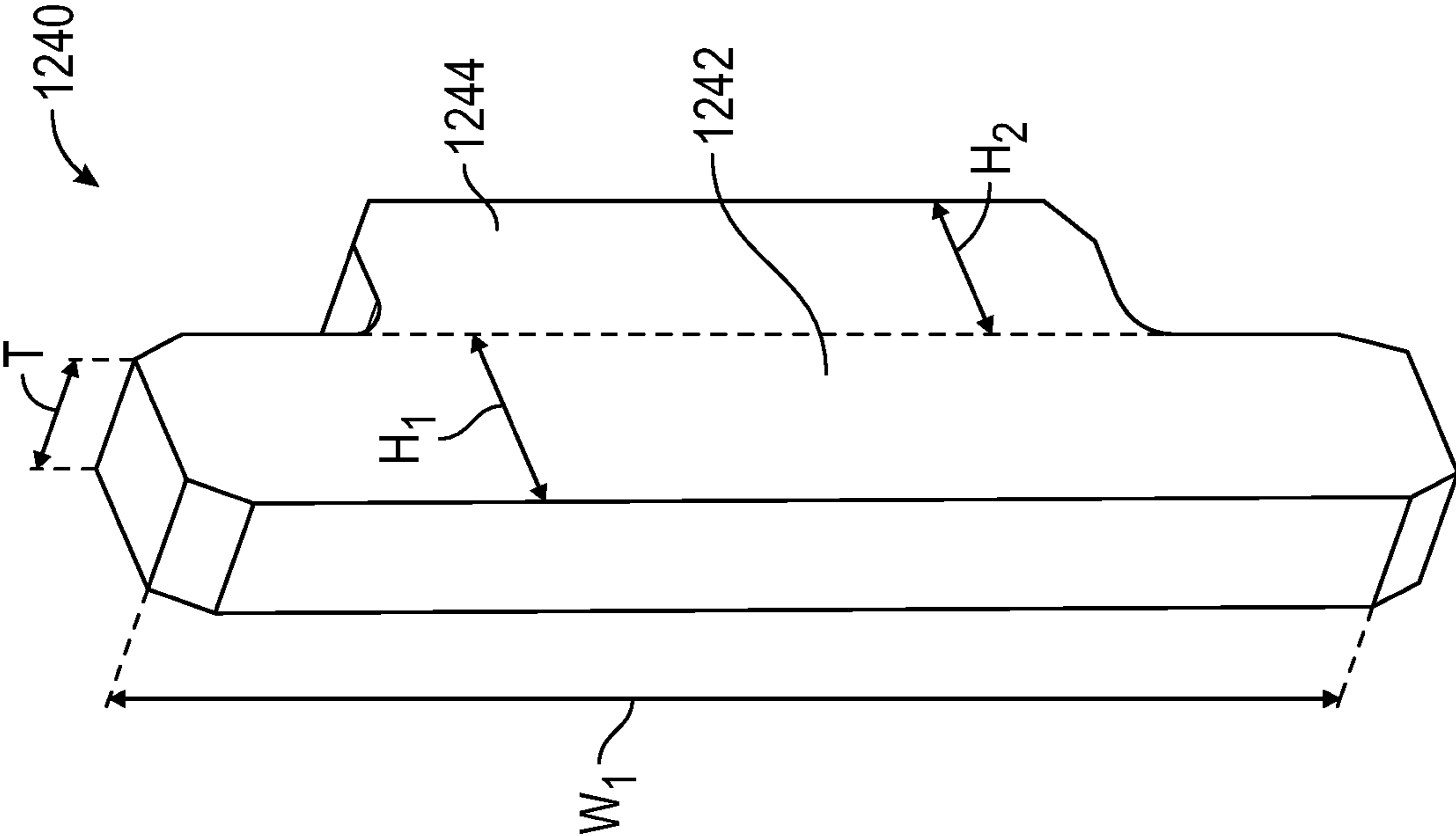


FIG. 74

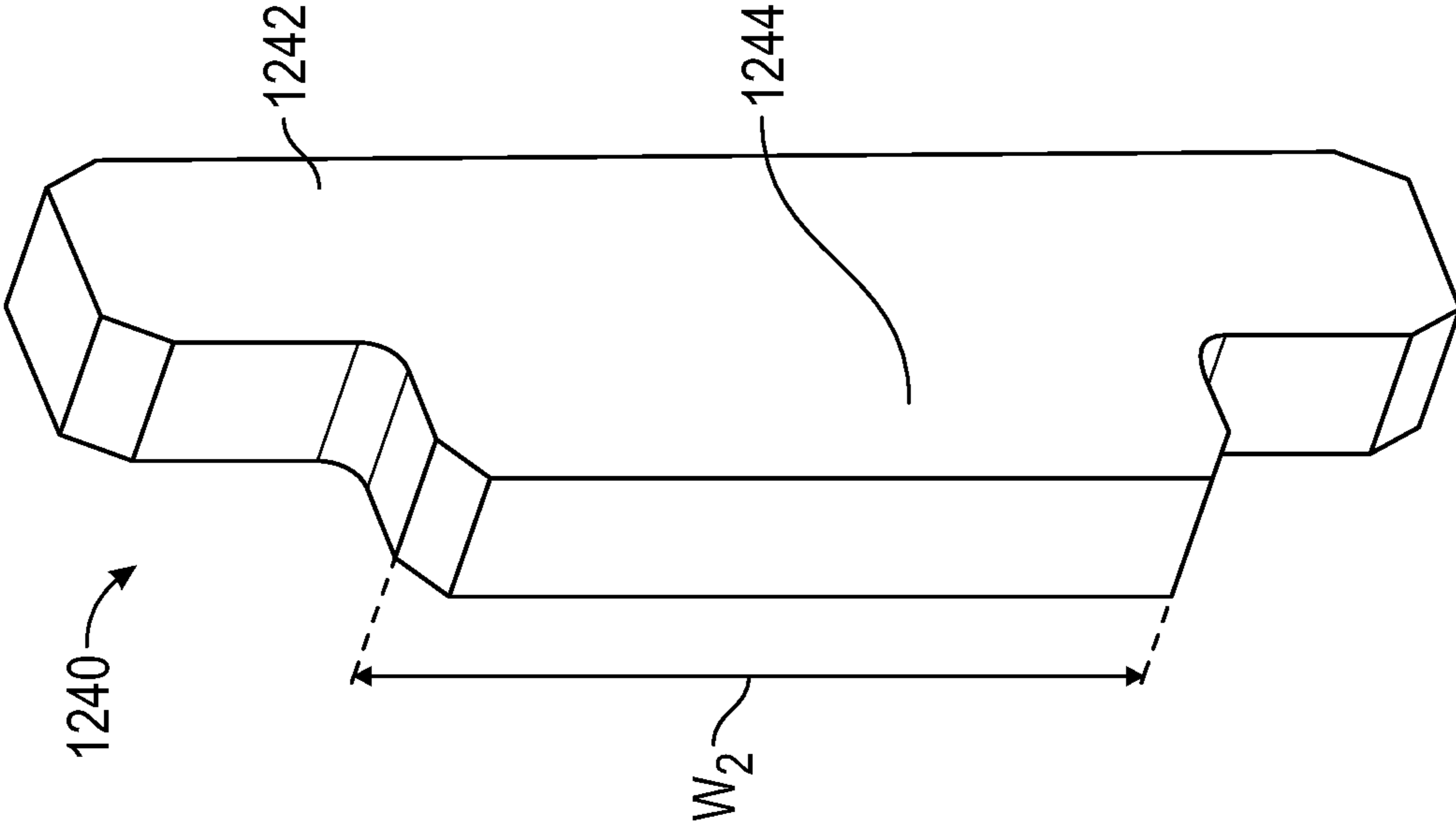


FIG. 73

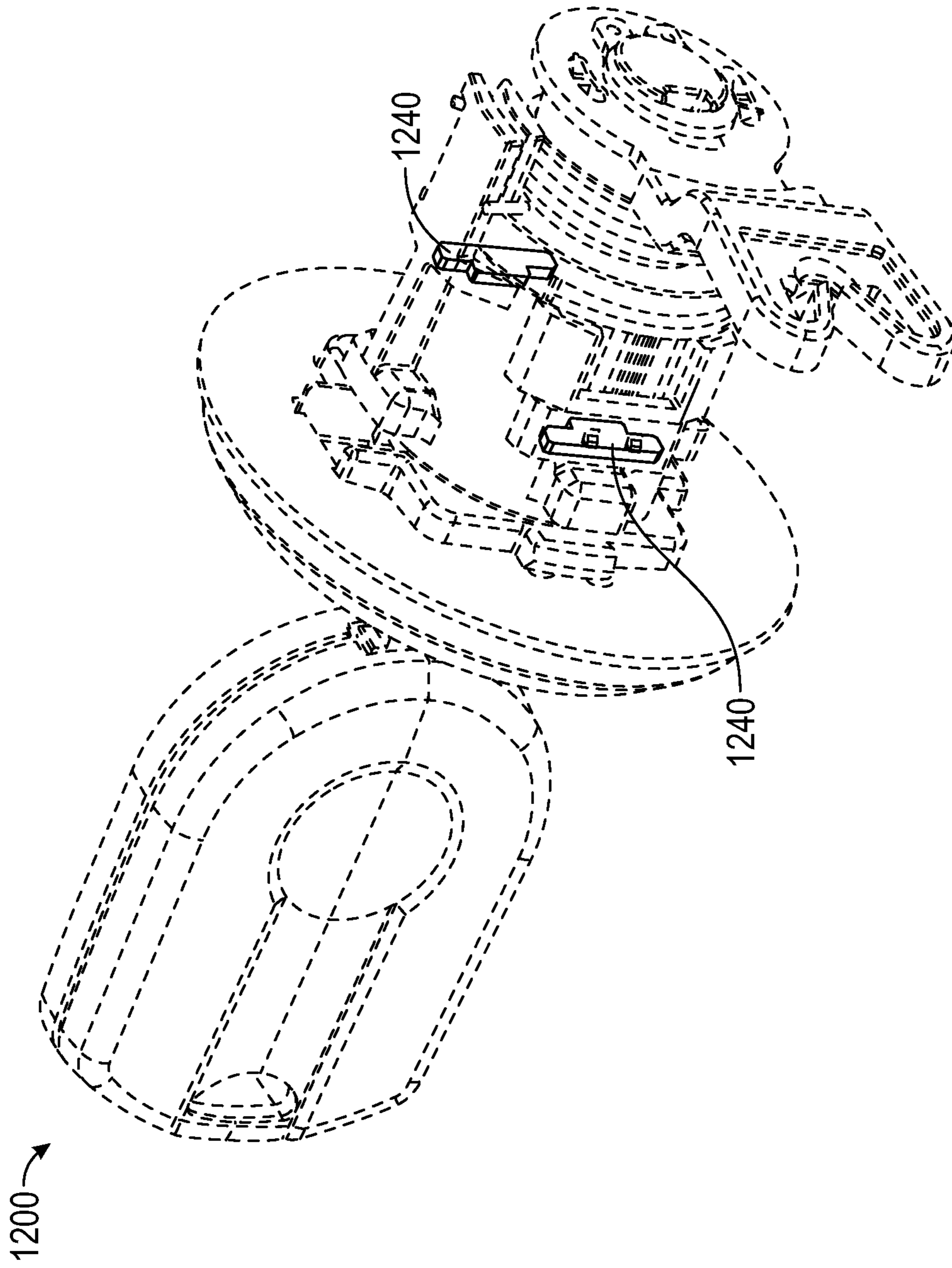


FIG. 75

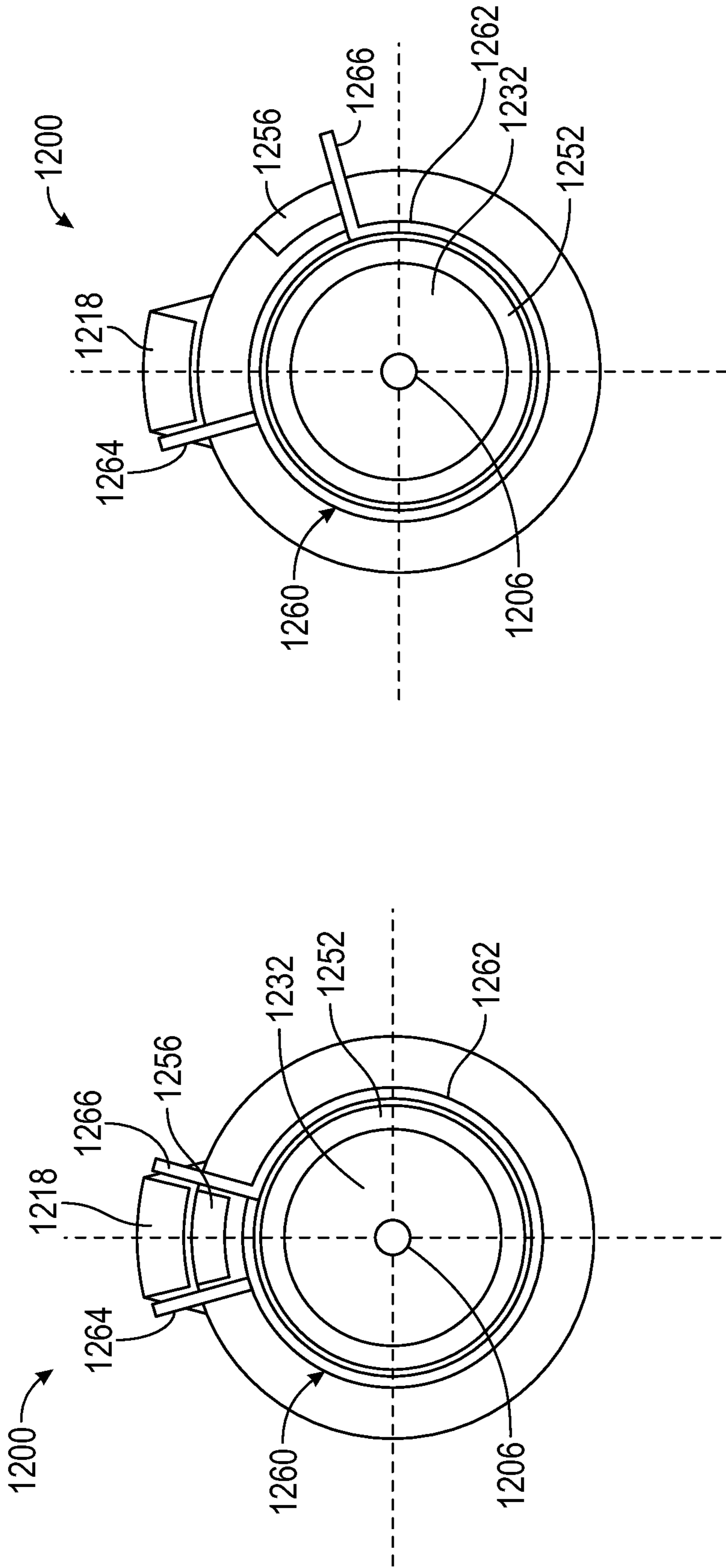


FIG. 77

FIG. 76

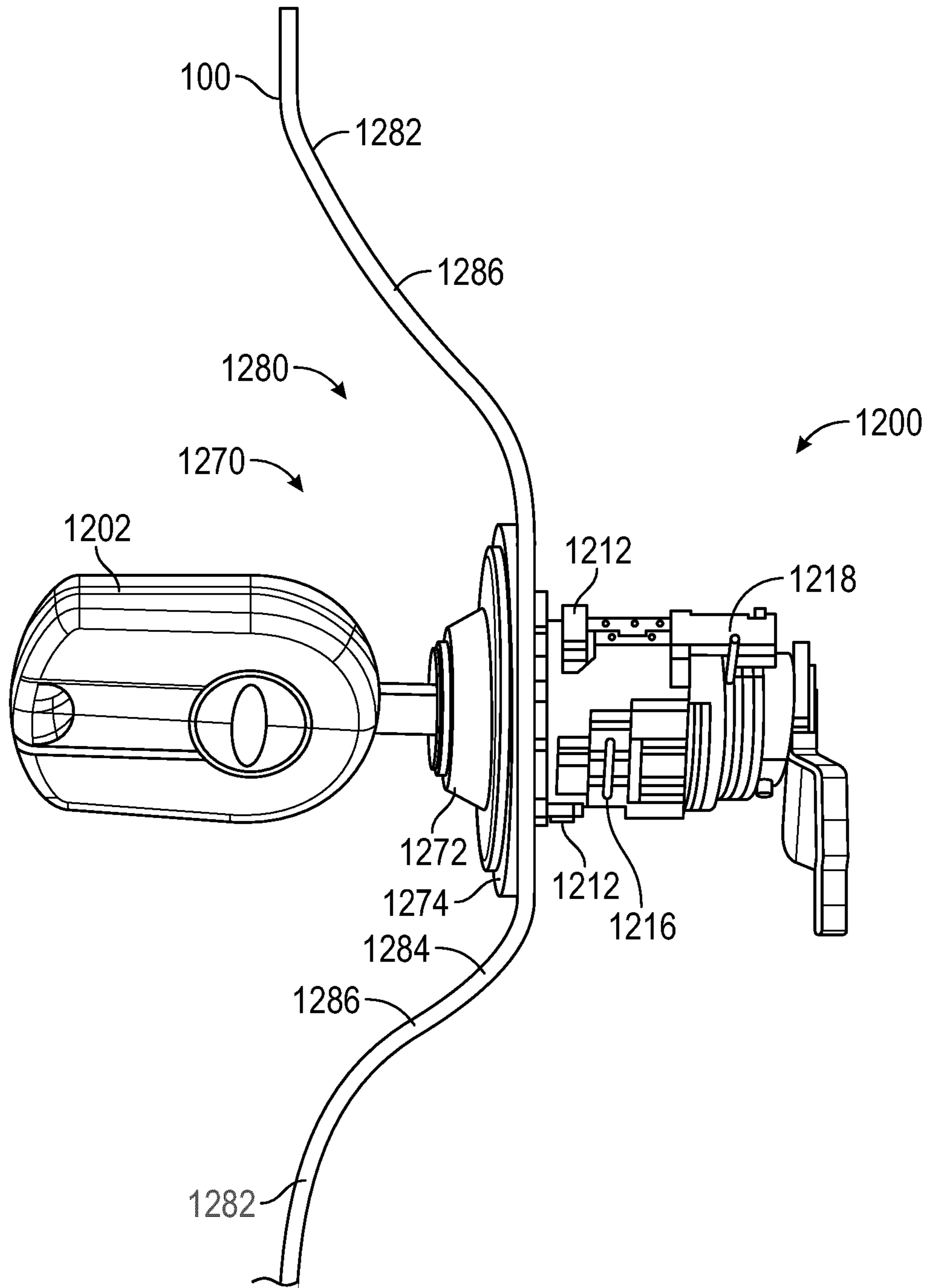


FIG. 78

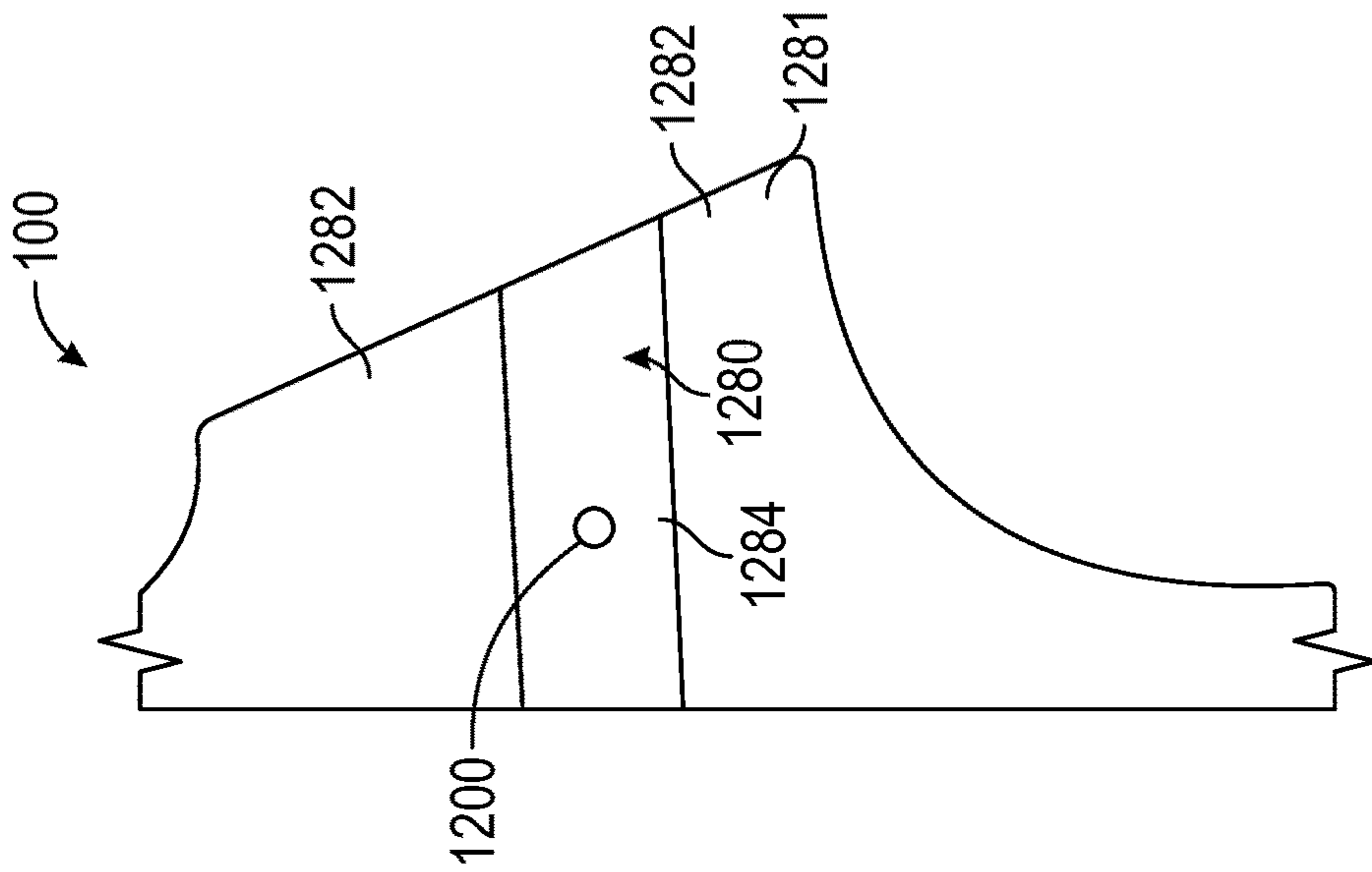


FIG. 79

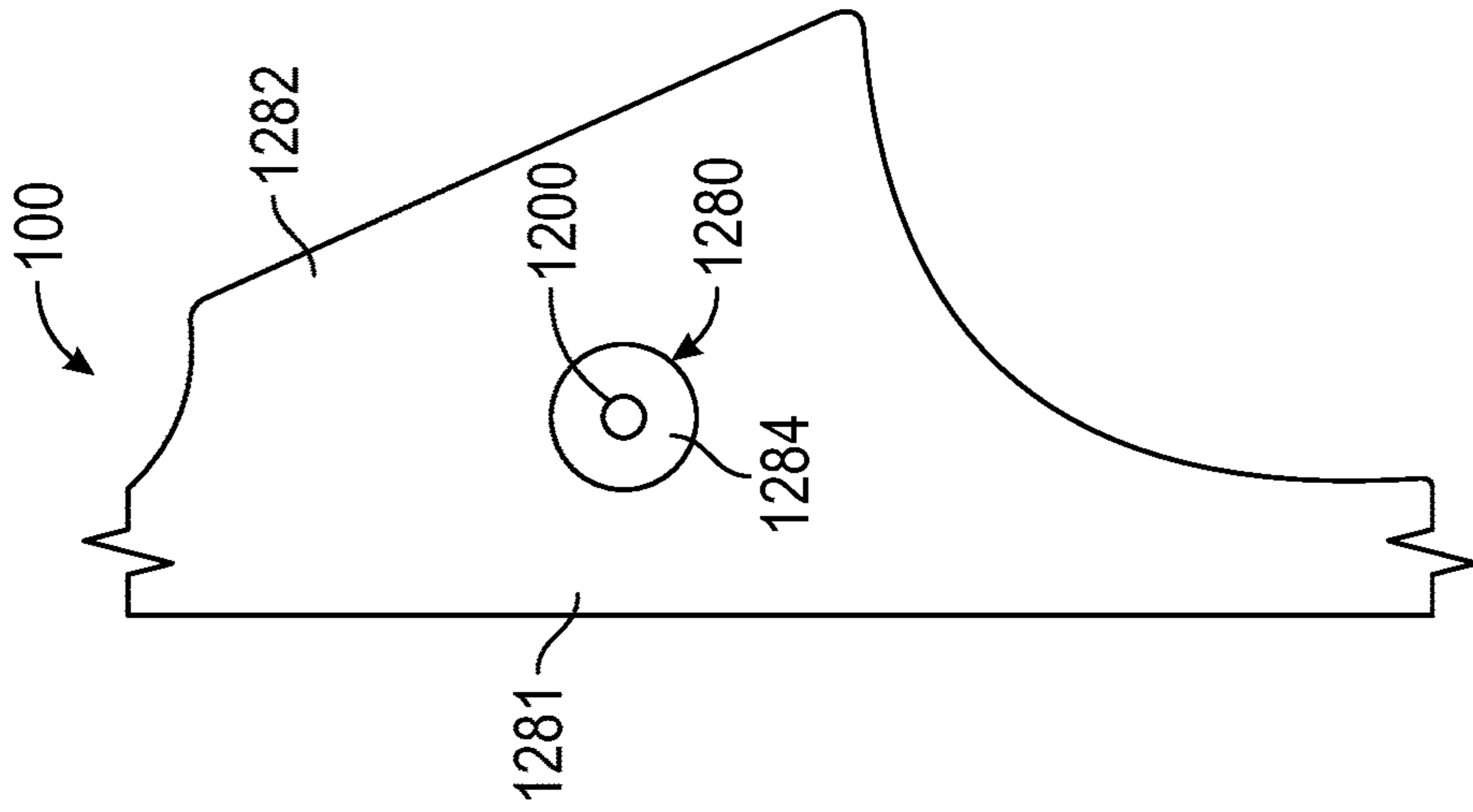


FIG. 80

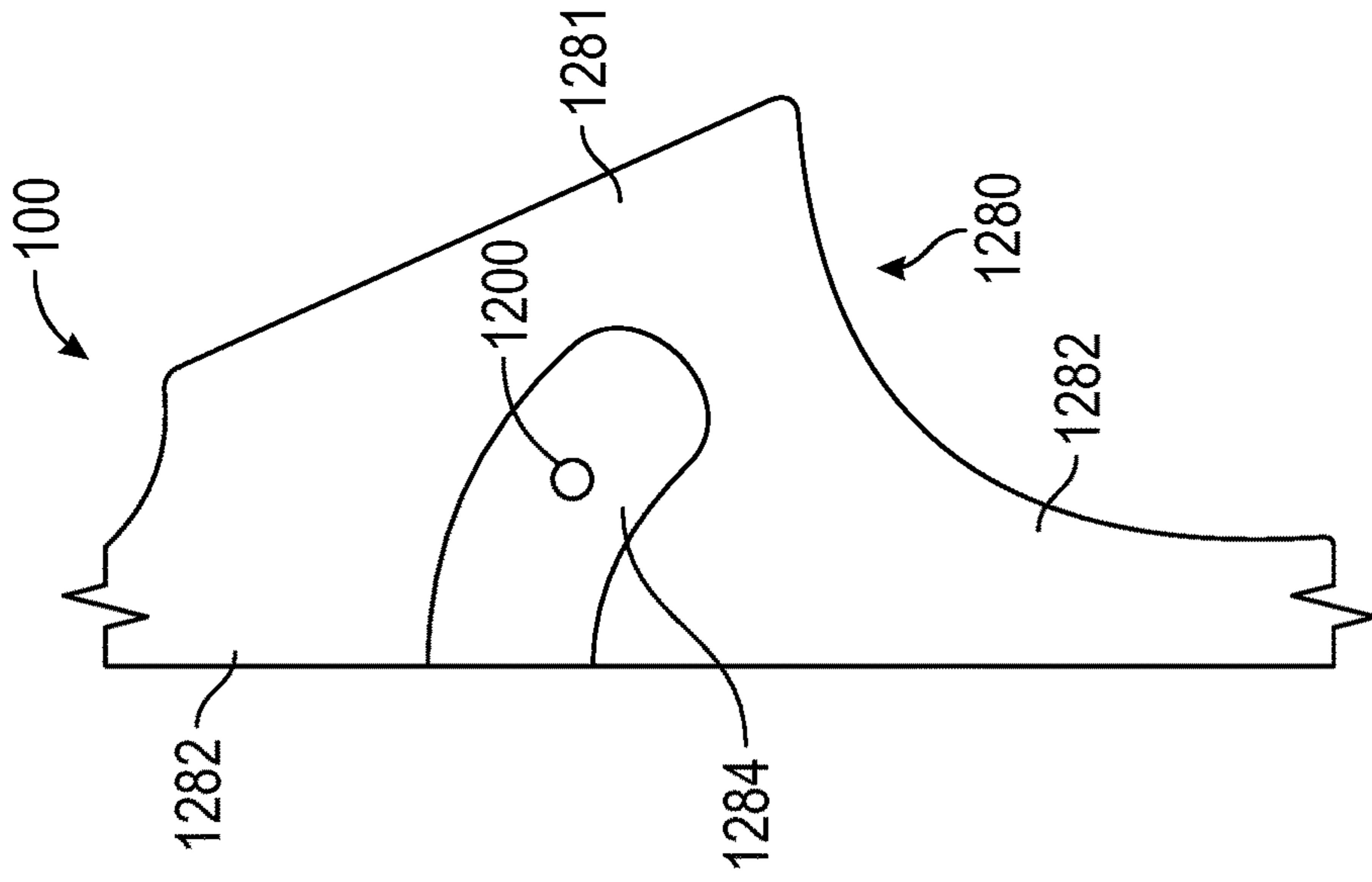


FIG. 81

VISIBILITY ENHANCEMENTS FOR DELIVERY VEHICLE

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 17/369,160, filed Jul. 7, 2021, which (a) claims the benefit of and priority to (i) U.S. Provisional Patent Application No. 63/049,374, filed Jul. 8, 2020, (ii) U.S. Provisional Patent Application No. 63/049,377, filed Jul. 8, 2020, (iii) U.S. Provisional Patent Application No. 63/049,438, filed Jul. 8, 2020, (iv) U.S. Provisional Patent Application No. 63/049,444, filed Jul. 8, 2020, (v) U.S. Provisional Patent Application No. 63/049,446, filed Jul. 8, 2020, and (vi) U.S. Provisional Patent Application No. 63/049,456, filed Jul. 8, 2020, and (b) is related to (i) U.S. patent application Ser. No. 17/369,303, filed Jul. 7, 2021, (ii) U.S. patent application Ser. No. 17/369,762, filed Jul. 7, 2021, (iii) U.S. patent application Ser. No. 17/369,755, filed Jul. 7, 2021, (iv) U.S. patent application Ser. No. 17/369,652, filed Jul. 7, 2021, and (v) U.S. patent application Ser. No. 17/369,667, filed Jul. 7, 2021, all of which are incorporated herein by reference in their entireties.

BACKGROUND

Delivery vehicles may have a number of doors, a cab, and a cargo portion. An operator may operate the vehicle from the cab. The cargo portion may serve as a storage area for parcels. The doors may provide entry and exit points for the operator to and from the cab and/or the cargo portion.

SUMMARY

One embodiment relates to a vehicle assembly. The vehicle assembly includes a vehicle body and a driver seat. The vehicle body defines a driver compartment having a first door with a first window and a second door with a second window. The driver seat is disposed within the driver compartment. When the driver seat is in a position that accommodates an operator being in a 95th male height percentile, the operator within the driver seat can see out of (i) the first window at a first angle relative to a forward looking direction that is parallel with a longitudinal axis of the vehicle body and (ii) the second window at a second angle relative to the forward looking direction. Each of the first angle and the second angle is at least 95 degrees.

Another embodiment relates to a vehicle assembly. The vehicle assembly includes a vehicle body defining a driver compartment and a cargo compartment positioned rearward of the driver compartment. The driver compartment has a door with a window. The vehicle body has A-pillars positioned at a front end of the driver compartment. At least one of (a) the A-pillars have a length of at least one meter or (b) the door has a first height of at least 1.6 meters and the window has a second height that is at least 60% of the first height.

Still another embodiment relates to a vehicle assembly. The vehicle assembly includes a vehicle body defining a driver compartment having a door with a window. The vehicle body has A-pillars positioned at a front end of the driver compartment. At least one of (a) the door has a first height of at least 1.6 meters and the window has a second height that is at least 60% of the first height, (b) the A-pillars have a length of at least 1.10 meters, or (c) when a driver seat is in a position within the vehicle body that accommodates

an operator being in a 95th male height percentile, the operator within the driver seat can see out of the window at an angle of at least 100 degrees relative to a forward looking direction that is parallel with a longitudinal axis of the vehicle body.

This summary is illustrative only and is not intended to be in any way limiting. Other aspects, inventive features, and advantages of the devices or processes described herein will become apparent in the detailed description set forth herein, taken in conjunction with the accompanying figures, wherein like reference numerals refer to like elements.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a rear perspective view of a delivery vehicle, according to an exemplary embodiment.

FIG. 2 is a partial side view of the delivery vehicle of FIG. 1, according to an exemplary embodiment.

FIG. 3 is a front perspective view of the delivery vehicle of FIG. 1, according to an exemplary embodiment.

FIG. 4 is a left side perspective view of the delivery vehicle of FIG. 1, according to an exemplary embodiment.

FIG. 5 is a detailed view of a primary driver compartment of the delivery vehicle of FIG. 1, according to an exemplary embodiment.

FIG. 6 is a right side perspective view of the delivery vehicle of FIG. 1 without a side door assembly, according to an exemplary embodiment.

FIG. 7 is a right side perspective view of the delivery vehicle of FIG. 6 having the side door assembly, according to an exemplary embodiment.

FIGS. 8 and 9 are various detailed views of a frame of the delivery vehicle of FIG. 1, according to an exemplary embodiment.

FIG. 10 is a detailed front view of a seating position of a seat within a cab of the delivery vehicle of FIG. 1, according to an exemplary embodiment.

FIG. 11 is a detailed side view of the seating position of the seat within the cab of the delivery vehicle of FIG. 10, according to an exemplary embodiment.

FIGS. 12 and 13 are various detailed interior cab views of the delivery vehicle of FIG. 1, according to an exemplary embodiment.

FIGS. 14-17 are various views of a visibility envelope of the delivery vehicle of FIG. 1, according to an exemplary embodiment.

FIG. 18 is a left side detailed view of a cab of the delivery vehicle of FIG. 1 having a mail tray in a first position, according to an exemplary embodiment.

FIG. 19 is a left side detailed view delivery vehicle of FIG. 18 having a repositionable training seat in the first position, according to an exemplary embodiment.

FIG. 20 is a front interior view of the delivery vehicle of FIG. 19, according to an exemplary embodiment.

FIG. 21 is a perspective view of the repositionable seat of FIG. 19, according to an exemplary embodiment.

FIGS. 22 and 23 are various right side views of the delivery vehicle of FIG. 19 with the repositionable training seat in a second position, according to an exemplary embodiment.

FIG. 24 is a partial side view of the delivery vehicle of FIG. 1 including a cargo shelf assembly, according to an exemplary embodiment.

FIG. 25 is a detailed view of the cargo shelf assembly of FIG. 24, according to an exemplary embodiment.

FIG. 26 is a detailed view of a frame mount portion of the cargo shelf assembly of FIG. 25, according to an exemplary embodiment.

FIG. 27 is a detailed view of a lower strap portion of the cargo shelf assembly of FIG. 25, according to an exemplary embodiment.

FIG. 28 is a detailed view of an upper strap portion of the cargo shelf assembly of FIG. 25, according to an exemplary embodiment.

FIG. 29 is a detailed view of an adjustable portion of the cargo shelf assembly of FIG. 25, according to an exemplary embodiment.

FIG. 30 is a front perspective view of the delivery vehicle of FIG. 1 having the side door assembly, according to an exemplary embodiment.

FIG. 31 is a front perspective view of the side door assembly of the delivery vehicle of FIG. 30, according to an exemplary embodiment.

FIG. 32 is a front perspective view of the delivery vehicle of FIG. 30 with a front door of the side door assembly of FIG. 31 in an open position, according to an exemplary embodiment.

FIG. 33 is a front perspective view of the delivery vehicle of FIG. 30 with a rear door of the side door assembly of FIG. 31 in an open position, according to an exemplary embodiment.

FIG. 34 is a front perspective view of an upper guide rail of the side door assembly of FIG. 31, according to an exemplary embodiment.

FIG. 35 is a top perspective view of the delivery vehicle of FIG. 8 with a roof of the delivery vehicle removed, detailing a sealing arrangement between the front door and the rear door of the side door assembly of FIG. 31, according to an exemplary embodiment.

FIG. 36 is another top perspective view of the delivery vehicle of FIG. 30 with the roof of the delivery vehicle removed, once again detailing the sealing arrangement between the front door and the rear door of the side door assembly of FIG. 31, according to an exemplary embodiment.

FIG. 37 is another top perspective view of the delivery vehicle of FIG. 30 with the roof of the delivery vehicle removed, detailing an opening mechanism between the front door and the rear door of the side door assembly of FIG. 31, according to an exemplary embodiment.

FIG. 38 is an interior perspective view of the delivery vehicle of FIG. 30, detailing a handle assembly of the opening mechanism of FIG. 37, according to an exemplary embodiment.

FIG. 39 is a front perspective view of the delivery vehicle of FIG. 30, detailing an initial step in an installation process to couple the side door assembly of FIG. 31 to the delivery vehicle, according to an exemplary embodiment.

FIG. 40 is a front perspective view of the delivery vehicle of FIG. 30, detailing a front door installation step in the installation process to couple the front door of the side door assembly of FIG. 31 to the delivery vehicle, according to an exemplary embodiment.

FIG. 41 is a front perspective view of the delivery vehicle of FIG. 30, detailing a partial guide rail extension step in the installation process to couple the side door assembly of FIG. 31 to the delivery vehicle, according to an exemplary embodiment.

FIG. 42 is a detailed view of the guide rail extension step taken from FIG. 41, according to an exemplary embodiment.

FIG. 43 is a front perspective view of the delivery vehicle of FIG. 30, detailing a rear door installation step in the

installation process to couple the rear door of the side door assembly of FIG. 31 to the delivery vehicle, according to an exemplary embodiment.

FIG. 44 is a front perspective view of the delivery vehicle of FIG. 30, detailing a second partial guide rail extension step in the installation process to couple the side door assembly of FIG. 31 to the delivery vehicle, according to an exemplary embodiment.

FIG. 45 is a detailed view of the second partial guide rail extension step taken from FIG. 44, according to an exemplary embodiment.

FIG. 46 is a detailed view of a lower guide rail extension step taken from FIG. 44, according to an exemplary embodiment.

FIG. 47 is a front perspective view of the delivery vehicle of FIG. 30, detailing a rear door movement step in the installation process to couple the side door assembly of FIG. 31 to the delivery vehicle, according to an exemplary embodiment.

FIG. 48 is a front perspective view of the delivery vehicle of FIG. 30, detailing a guard plate coupling step in the installation process to couple a guard plate of the side door assembly of FIG. 31 to the delivery vehicle, according to an exemplary embodiment.

FIG. 49 is a side view of a window assembly of the delivery vehicle of FIG. 1, according to an exemplary embodiment.

FIG. 50 is a perspective view of the window assembly of FIG. 49, according to an exemplary embodiment.

FIG. 51 is a perspective view of the window assembly of FIG. 49, showing a movable window translatable in a direction, according to an exemplary embodiment.

FIG. 52 is a perspective view of the window assembly of FIG. 49, according to an exemplary embodiment.

FIG. 53 is a perspective view of the window assembly of FIG. 49 including a seal positioned between a movable window and a fixed window of the window assembly, according to an exemplary embodiment.

FIG. 54 is a detailed perspective view of the seal of FIG. 53, according to an exemplary embodiment.

FIG. 55 is a detailed perspective cross-sectional view of the seal of FIG. 53, according to an exemplary embodiment.

FIG. 56 is a perspective cross-sectional view of the seal of FIG. 53, according to an exemplary embodiment.

FIG. 57 is a perspective view of a portion of a door panel configured to receive the movable window of the window assembly of FIG. 49, according to an exemplary embodiment.

FIG. 58 is a right side perspective view of the side door assembly of the delivery vehicle of FIG. 1, according to an exemplary embodiment.

FIGS. 59 and 60 are perspective views of an opening mechanism and a door locking assembly of the delivery vehicle of FIG. 1, according to an exemplary embodiment.

FIGS. 61 and 62 are perspective views of the door locking assembly of FIG. 59, according to an exemplary embodiment.

FIG. 63 is a partial side section view of the door locking assembly of FIG. 59, according to an exemplary embodiment.

FIG. 64 is a front view of a sleeve of the door locking assembly of FIG. 59, according to an exemplary embodiment.

FIG. 65 is a front view of a core assembly of the door locking assembly of FIG. 59, according to an exemplary embodiment.

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FIGS. 66-69 are perspective views of the door locking assembly of FIG. 59, according to an exemplary embodiment.

FIGS. 70 and 71 are side views of the core assembly of FIG. 65 in various states of engagement with a key, according to an exemplary embodiment.

FIG. 72 is an exploded perspective view of the door locking assembly of FIG. 59, according to an exemplary embodiment.

FIGS. 73 and 74 are perspective views of a retaining pin of the door locking assembly of FIG. 59, according to an exemplary embodiment.

FIG. 75 is a perspective view of the door locking assembly of FIG. 59, according to an exemplary embodiment.

FIGS. 76 and 77 are rear views of the door locking assembly of FIG. 59, according to an exemplary embodiment.

FIG. 78 is a partial section view of a body of the delivery vehicle of FIG. 1, according to an exemplary embodiment.

FIGS. 79-81 are side views of a portion of a body of the delivery vehicle of FIG. 1, according to various exemplary embodiments.

DETAILED DESCRIPTION

Before turning to the figures, which illustrate certain exemplary embodiments in detail, it should be understood that the present disclosure is not limited to the details or methodology set forth in the description or illustrated in the figures. It should also be understood that the terminology used herein is for the purpose of description only and should not be regarded as limiting.

Overall Vehicle

According to the exemplary embodiment shown in FIGS. 1-7, a vehicle (e.g., a parcel vehicle, a cargo transport vehicle, a mail vehicle, a postal vehicle, a postal van, a truck, a van, etc.), shown as delivery vehicle 10, is configured to facilitate improved parcel delivery. Generally, the delivery vehicle 10 may be a specialized vehicle that transports parcels (e.g., mail, packages, etc.) from a distribution center (e.g., a post office, a warehouse, etc.) to various delivery locations (e.g., recipients' homes, offices, etc.).

As shown in FIGS. 1-7, the delivery vehicle 10 includes a chassis, shown as a frame 12. The frame 12 defines a first end, shown as front end 14, an opposing second end, shown as rear end 16, a first lateral side (e.g., a driver side, etc.), shown as right side 18, and an opposing second lateral side (e.g., a passenger side, etc.), shown as left side 20, of the delivery vehicle 10. While components of the delivery vehicle 10 may be described as being positioned along, proximate, adjacent, etc. the right side 18 or the left side 20 herein, it should be understood that such components could be positioned on the opposite side. As shown in FIG. 1, the frame 12 also defines a longitudinal axis, shown as central axis 22, extending longitudinally through the delivery vehicle 10 from the front end 14 to the rear end 16. As shown in FIG. 1-7, the frame 12 supports a first axle, shown as front axle 60, having a first plurality of tractive elements, shown as front wheels 62, coupled thereto; a second axle, shown as rear axle 64, having a second plurality of tractive elements, shown as rear wheels 66, coupled thereto; a power unit, shown as powertrain 70, that drives the front axle 60 and/or the rear axle 64 to move the delivery vehicle 10; and a body assembly, shown as body 100.

As shown in FIG. 5, the powertrain 70 includes a primary driver or prime mover, shown as engine 72, coupled to and disposed within a primary driver compartment, shown as

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engine compartment 24, at the front end 14 of the frame 12. In some embodiments, the powertrain 70 is a traditional, internal combustion engine driven powertrain. In some embodiments, the powertrain 70 additionally includes on-board energy storage (e.g., a battery pack, etc.), a generator, and/or an electric motor to supplement the engine 72 such that the powertrain 70 is a hybrid powertrain. In some embodiments, the powertrain 70 does not include the engine 72. Rather, the primary driver may be an electric motor and the powertrain 70 may include on-board energy storage such that the powertrain 70 is an electric powertrain. In another embodiment, the primary driver includes a fuel cell and an electric motor such that the powertrain 70 is a fuel cell electric powertrain.

As shown in FIGS. 1-4, 6, and 7, the body 100 includes a hood, shown as hood 110, coupled to the front end 14 of the frame 12 and extending over the engine compartment 24 within which the engine 72 is positioned; a first pair of pillars, shown as A-pillars 112; a second pair of pillars, shown as B-pillars 114; a third pair of pillars, shown as C-pillars 116; a front cabin, shown as cab 200, positioned between the A-pillars 112 and the B-pillars 114; a rear storage section, shown as cargo body 400, positioned behind the cab 200 and between the B-pillars 114 and the C-pillars 116; a divider, shown as partition 600, extending between the B-pillars 114 and at least partially separating the cab 200 from the cargo body 400; and a door assembly, shown as side door assembly 700.

As shown in FIGS. 1-4, 6, and 7, the cab 200 defines a first interior section or zone, shown as driver compartment 202, a first opening, shown as right cab opening 204, and a second opening, shown as left cab opening 206. The right cab opening 204 is positioned along the right side 18 of the delivery vehicle 10. The right cab opening 204 facilitates ingress into and egress from the driver compartment 202. The driver compartment 202 may be configured to contain or otherwise support a number of seats (e.g., one or more seats, etc.), storage units (e.g., a mail tray, etc.), and/or other equipment. As shown in FIGS. 1 and 4, the driver compartment 202 is configured to provide seating for an operator (e.g., a driver, etc.) of the delivery vehicle 10 with a seat, shown as driver seat 210. In some embodiments, the driver compartment 202 is configured to provide seating for a passenger of the delivery vehicle 10 (e.g., a temporary training seat, a repositionable passenger seat, etc.). The driver compartment 202 may also include various controls for driving the delivery vehicle 10 and/or operating the systems thereof (e.g., a user interface, a touchscreen, a display, a steering wheel, an accelerator pedal, a brake pedal, control levers, buttons, switches, etc.).

As shown in FIGS. 1-3 and 6, the cargo body 400 defines a second interior section or zone, shown as cargo compartment 402, a third opening, shown as side cargo opening 404, and a fourth opening, shown as rear cargo opening 406. The side cargo opening 404 is positioned along the right side 18 of the delivery vehicle 10 adjacent the right cab opening 204 with the right B-pillar 114 separating the two. The side cargo opening 404 facilitates ingress into and egress from the cargo compartment 402 from the right side 18 of the delivery vehicle 10. The rear cargo opening 406 is positioned at the rear end 16 of the delivery vehicle 10. The rear cargo opening 406 facilitates ingress into and egress from the cargo compartment 402 from the rear end 16 of the delivery vehicle 10. According to an exemplary embodiment, the cargo compartment 402 is configured to receive and store parcels (e.g., mail, packages, etc.) for transport and delivery via the delivery vehicle 10. In some embodiments, the cargo

compartment **402** includes cabinets, shelves, racks, and/or other storage devices to facilitate organizing and securing the parcels within the cargo compartment **402**.

As shown in FIGS. **1** and **3**, the partition **600** is a partial partition that defines an opening, shown as passageway **602**, that connects the driver compartment **202** to the cargo compartment **402**. In some embodiments, the partition **600** includes a door or gate that at least partially and selectively encloses the passageway **602**. In other embodiments, the partition **600** is a full partition that completely segregates the driver compartment **202** from the cargo compartment **402**.

As shown in FIG. **7**, the side door assembly **700** includes a first door, shown driver cab door **800**, a second door, shown as side cargo door **1000**, and a locking assembly, shown as door locking assembly **1200**. The driver cab door **800** extends over the right cab opening **204** and is selectively openable to access the driver compartment **202**. According to an exemplary embodiment, the driver cab door **800** translates or slides rearward along the right side **18** of the body **100** from a closed position to an open position (e.g., such that the driver cab door **800** at least partially overlaps with the side cargo door **1000**, extends past the B-pillar **114**, etc.). In other embodiments, the driver cab door **800** is hingedly coupled to the body **100** (e.g., the A-pillar **112**, etc.) and pivots between a closed position and an open position. As shown in FIG. **7**, the driver cab door **800** includes a panel, shown as door panel **802**, and a window assembly, shown as window assembly **900**, disposed within the door panel **802**. According to an exemplary, the delivery vehicle **10** includes a second cab door or passenger cab door positioned on the left side **20** of the cab **200** that extends over the left cab opening **206** and is selectively openable to access the driver compartment **202**. The passenger cab door can similarly slide or pivot between an open position and a closed position to facilitate ingress into and egress from the cab **200** from the left side **20** of the delivery vehicle **10**. According to an exemplary embodiment, the passenger cab door similarly includes a window disposed therein.

As shown in FIG. **7**, the side cargo door **1000** extends over the side cargo opening **404** and is selectively openable to access the cargo compartment **402**. According to an exemplary embodiment, the side cargo door **1000** translates or slides forward along the right side **18** of the body **100** from a closed position to an open position (e.g., such that the side cargo door **1000** at least partially overlaps with the driver cab door **800**, toward the A-pillar **112**, etc.). In another embodiment, the side cargo door **1000** translates or slides rearward along the right side **18** of the body **100** from a closed position to an open position (e.g., away from the right cab opening **204**, toward the C-pillar **116**, etc.). In other embodiments, the side cargo door **1000** is hingedly coupled to the body **100** (e.g., the B-pillar **114**, etc.) and pivots between a closed position and an open position. According to an exemplary embodiment, the delivery vehicle **10** includes a rear door assembly that includes a rear cargo door. The rear cargo door extends over the rear cargo opening **406** and is selectively openable to access the cargo compartment **402**.

Visibility Enhancements

According to an exemplary embodiment, the design of the delivery vehicle **10** and the arrangement of the components thereof (e.g., the front end **14** of the frame **12**, the engine **72**, the hood **110**, the A-pillars **112**, the driver seat **210**, the driver cab door **800**, the passenger cab door, etc.) provide various visibility enhancements that improve the visibility of the driver out of the cab **200**.

As shown in FIGS. **5**, **8**, and **9**, the frame **12** includes a pair of frame rails, shown as frame rails **30**, that define the engine compartment **24** and provide mounting locations for the engine **72**. According to an exemplary embodiment, the engine **72** is undersized or smaller than a typical engine used in a vehicle of the weight and size of the delivery vehicle **10**. According to an exemplary embodiment, the delivery vehicle **10** has (i) overall dimensions of between 4.5 meters to 7.5 meters (e.g., 5 meters to 7 meters, 5.5 meters to 6.5 meters, 5.5 meters to 6 meters, etc.) and (ii) a weight of between 4,000 to 7,500 lbs. (e.g., 4,000; 4,500; 5,000; 5,500; 6,000; 6,500; 7,000; 7,500; etc. lbs.). In one embodiment, the engine **72** is a 2.0 liter turbocharged engine that outputs approximately 250 horsepower or less. Further, according to the exemplary embodiment shown in FIG. **5**, such an undersized engine **72** can be transversely mounted between the frame rails **30** at a lower position than is typical, which minimizes the length of the engine **72** along the central axis **22** and the height at which engine **72** extends vertically within the engine compartment **24**. Accordingly, the front end **14** of the frame **12** and the engine compartment **24** defined thereby can be more compact and truncated, which allows for a shorter hood **110**, thereby providing enhanced forward visibility from the driver compartment **202** over the hood **110**.

As shown in FIGS. **2**, **5**, and **8-11**, the frame **12**, the engine **72**, the front axle **60**, and the suspension components (e.g., coilovers, etc.) of the delivery vehicle **10** are arranged to provide an enhanced position of the driver seat **210** and, therefore, improve the visibility from the driver seat **210** within the driver compartment **202**. As shown in FIGS. **8** and **9**, the frame **12** includes suspension interfaces, shown as jounce towers **32**, coupled to and extending upward from the frame rails **30**, and a rear firewall, shown as firewall **40**, positioned rearward of the jounce towers **32**. Specifically, the arrangement of the frame rails **30** and the jounce towers **32** facilitate positioning the engine **72**, the front axle **60**, and the suspension components forward of the firewall **40** such that design of the firewall **40** (e.g., the shape, position, etc.) thereof is independent of such components. Therefore, as shown in FIG. **9**, the firewall **40** can be substantially flat and arranged substantially vertically, which maximizes the space of the driver compartment **202** of the cab **200** and facilitates positioning the driver seat **210** in a more desirable position to improve visibility.

Specifically, as shown in FIG. **10**, the arrangement of the firewall **40**, the jounce towers **32**, the front axle **60**, and the engine **72** facilitates centering the driver seat **210** and a steering assembly, shown as steering column **220**, along a plane, shown as central seating plane **26**, spaced a first distance d_1 from the A-pillar **112** along the right side **18** of the delivery vehicle **10** relative to a total width w between the A-pillar **112** along the right side **18** and the A-pillar **112** along the left side **20** of the delivery vehicle **10**. According to an exemplary embodiment, the distance d_1 is less than 25% of the total width w .

As shown in FIG. **11**, the A-pillars **112** have a length L . Typically, a vehicle of similar size to the delivery vehicle **10** has A-pillars that are less than 0.75 meters long. However, the length L of the A-pillars **112** of the delivery vehicle **10** have been extended, which provides a lower position of the hood **110** and a larger front windshield, and further improves forward visibility from the driver compartment **202**. According to an exemplary embodiment, the length L of the A-pillars **112** of the delivery vehicle **10** is at least 1.0 meter. In some embodiments, the length L of the A-pillars **112** is at least 1.10 meters (e.g., 1.12 meters, 1.15, meters, etc.). As

shown in FIG. 12, the A-pillars 112 have an overlapping construction including an inner component, shown as inner portion 112a, and an outer component, shown as outer portion 112b, overlapping the inner portion 112a. Such an overlapping construction improves strength and, thereby, facilitates reducing the overall size of the A-pillars 112, which further improves forward and lateral visibility out of the driver compartment 202.

As shown in FIG. 11, the driver cab door 800 is configured such that driver cab door 800 (i.e., the door panel 802 and the window assembly 900) has a first height h_1 and the window assembly 900 has a second height h_2 . In some embodiments, the second height h_2 is at least 50% of the height h_1 . In some embodiments, the second height h_2 is at least 60% of the height h_1 . According to an exemplary embodiment, (i) the height h_1 is between 1.6 meters and 2.4 meters and (ii) the height h_2 is between 0.8 meters and 1.4 meters. The passenger cab door may be similarly arranged. Such an oversized window assembly 900 provides improved lateral visibility out of the right side 18 and the left side 20 of the cab 200 of the delivery vehicle 10.

As shown in FIG. 11, the driver seat 210 is positioned a distance d_2 forward of the rear edge of the window assembly 900. While the distance d_2 is variable (e.g., based on driver seating position preference, etc.), the distance d_2 is at least four inches when the driver seat 210 is in a position suitable for a male being in the 95th height percentile (e.g., approximately 6 feet 1 inch). Such a distance d_2 provides various advantages. First, when the driver reaches out of the window assembly 900 (e.g., to deposit mail into a mail box, etc.), the trailing edge of the driver cab door 800 is sufficiently spaced from the driver to effectively eliminate inadvertent contact between the trailing edge of the driver cab door 800 and the driver's arm. Second, the distance d_2 provides enhanced lateral visibility because the driver can see further back along the right side 18 and the left side 20 of the delivery vehicle 10, thereby reducing blind spots.

As shown in FIGS. 12 and 13, the cab 200 includes speed controls, shown as controls 230, including a first pedal, shown as accelerator pedal 232, and a second pedal, shown as brake pedal 234. According to an exemplary embodiment, the brake pedal 234 has a special offset to interface with the master brake cylinder.

As shown in FIGS. 14-17, the various visibility enhancements described herein facilitate providing an enhanced visibility envelope, shown as visibility envelope 300. The visibility envelope 300 is defined by various planes including a first plane, shown as rear right visibility plane 310; a second plane, shown as rear left visibility plane 320; a third pair of planes, shown as right A-pillar planes 330, including a first right A-pillar plane, shown as inner right A-pillar plane 332, and a second right A-pillar plane, shown as outer right A-pillar plane 334; and a fourth pair of planes, shown as left A-pillar planes 340, including a first left A-pillar plane, shown as inner left A-pillar plane 342, and a second left A-pillar plane, shown as outer left A-pillar plane 344.

As shown in FIG. 17, the driver seat 210 is positioned (e.g., at a position defined by the distance d_1 and the distance d_2 , in the 95th height percentile position, etc.) such that, relative to a forward looking direction 212 (e.g., a direction parallel with the central axis 22), (i) the rear right visibility plane 310 extends at angle θ from the trailing edge of the window assembly 900 along the right side 18 of the delivery vehicle 10 and (ii) the rear left visibility plane 320 extends at angle α from the trailing edge of the window assembly 900 along the left side 20 of the delivery vehicle 10. According to an exemplary embodiment, the angle θ and the

angle α are greater than 90 degrees. In some embodiment, the angle θ and the angle α are at least 95 degrees. In some embodiment, the angle θ and the angle α are at least 100 degrees. In some embodiments, the angle θ is at least 110 degrees. In some embodiments, the angle θ is at least 120 degrees. In some embodiments, the angle θ is at least 130 degrees. According to the exemplary embodiment shown in FIGS. 14-17, the angle θ is 135 degrees and the angle α is 100 degrees with the driver seat 210 at the distance d_2 in the 95th height percentile position. It should be understood that the angle θ and the angle α would increase if the driver seat 210 were moved forward from the 95th height percentile position by the driver (i.e. to accommodate a shorter height of the driver), thereby, increasing the distance d_2 .

As shown in FIG. 17, the A-pillars 112 are configured (as described above) to minimize visibility obstruction such that (i) the right A-pillar planes 330, depicting the visibility obstruction of the right A-pillar 112 from the driver seat 210, block only an angle β of the driver's view and (ii) the left A-pillar planes 340, depicting the visibility obstruction of the left A-pillar 112 from the driver seat 210, block only an angle γ of the driver's view. According to an exemplary embodiment, the angle β is at most 11.5 degrees and the angle γ is at most 5 degrees. According to an exemplary embodiment, the visibility range of the visibility envelope 300 (i.e., from the rear right visibility plane 310 to the rear left visibility plane 320, minus the angle β and the angle γ) from the driver seat 210 with the distance d_2 in the 95th height percentile position (e.g., with the angle θ of 135 degrees, with the angle α of 100 degrees, with the angle β of 11.5 degrees, with the angle of γ of 5 degrees, etc.) is approximately 218.5 degrees. The visibility from the driver seat 210 is dependent on the distance d_2 , however. Therefore, the visibility range may be between approximately 163.5 degrees (e.g., when the driver seat 210 is fully back, etc.) and approximately 240 degrees (e.g., when the driver seat 210 is fully forward, etc.) depending on the minimum distance d_2 and the maximum distance d_2 of the driver seat 210, respectively.

As shown in FIGS. 14-17, the visibility envelope 300 includes a downward sloping perimeter plane, shown as lower boundary visibility plane 350, that extends downward from the driver seat 210 (e.g., from the approximate eye position of a male being in the 95th height percentile, etc.), out of the driver compartment 202, and to the upper edge of a peripheral plane, shown as visibility periphery 360. The visibility periphery 360 is spaced a distance D around the delivery vehicle 10 (i.e., the right side 18 of the cab 200, the outer periphery of the hood 110, the left side 20 of the cab 200) through the visibility range of the visibility envelope 300 and extends vertically a height H . According to an exemplary embodiment, (i) the distance D is between 0.9 meters and 2 meters (e.g., 0.9, 1, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, etc. meters) and (ii) the height H is between 0.3 meters and 0.6 meters (e.g., 0.3, 0.35, 0.4, 0.45, 0.5, 0.55, 0.6, etc. meters). It should be understood that the distance D and the height H will be different for drivers of different heights (i.e., not in the male 95th height percentile).

Repositionable Seating Unit

According to the exemplary embodiment shown in FIGS. 18-23, the delivery vehicle 10 includes a repositionable storage rack, shown as mail tray 260, and a repositionable seating unit, shown as training seat unit 270, that are selectively interchangeable with one another at a first location, shown as first position 250, on the left side 20 of the driver compartment 202 of the cab 200 next to the driver seat 210. As shown in FIG. 18, the mail tray 260 includes a pair

of supports, shown as end supports 262, and a plurality of trays, shown as trays 264, extending between the end supports 262 in a stacked arrangement. According to an exemplary embodiment, the trays 264 are configured to temporarily store parcels (e.g., mail, packages, etc.) that are nearing their delivery locations. In some embodiments, the mail tray 260 is free standing. In some embodiments, the mail tray 260 is selectively securable to a first floor portion of the body 100, shown as cab floor 208, and/or the partition 600 (e.g., bolted, clipped, engages with a track, etc.).

As shown in FIGS. 19-21, the mail tray 260 is removed from the first position 250 within the driver compartment 202 and replaced with the training seat unit 270. As shown in FIGS. 19 and 20, the cab floor 208 within the driver compartment 202 includes a first interface, shown as cab seat interface 252, that defines a pair of slots, shown as cab engagement slots 254, that facilitate coupling the training seat unit 270 to the cab floor 208 in the first position 250.

As shown in FIGS. 20 and 21, the training seat unit 270 includes a frame assembly, shown as seat frame assembly 272, a padding assembly, shown as cushions 280, and a passenger restraint assembly (e.g., a 3-point seatbelt harness, a 5-point seatbelt harness, etc.), shown as seatbelt harness 290, integrated into a single seating unit. The seat frame assembly 272 includes a pair of legs, shown as legs 274; a bottom frame portion, shown as base frame 276, coupled to the legs 274 and extending substantially horizontally; and a back frame portion, shown as back frame 278, coupled to the rear of the base frame 276 and extending substantially vertically therefrom. The cushions 280 include a first cushion, shown as bottom cushion 282, disposed along the base frame 276, and a second cushion, shown as back cushion 284, disposed along the back frame 278. The seatbelt harness 290 includes a belt, shown as seatbelt 292, secured to the seat frame assembly 272 at a plurality of points (e.g., two points, four points, etc.), and a receiver or coupler, shown as seatbelt buckle 294, coupled to the seat frame assembly 272 (e.g., the base frame 276) and configured to selectively engage a corresponding coupler or tongue on the seatbelt 292.

As shown in FIG. 20, the legs 274 of the seat frame assembly 272 are configured to interface with the cab engagement slots 254 to facilitate securing the training seat unit 270 to the cab floor 208 in the first position 250. By way of example, the cab engagement slots 254 may include threaded apertures that receive bolts to secure the legs 274 of the seat frame assembly 272 to the cab seat interface 252. By way of another example, the cab engagement slots 254 may include threaded studs extending upward therefrom that receive nuts to secure the legs 274 of the seat frame assembly 272 to the cab seat interface 252.

As shown in FIGS. 22 and 23, the training seat unit 270 is selectively repositionable from the first position 250 within the driver compartment 202 to a second location, shown as second position 450, within the cargo compartment 402 of the cargo body 400. The cargo body 400 includes a second floor portion of the body 100, shown as cargo floor 408. The cargo floor 408 within the cargo compartment 402 includes a second interface, shown as cargo seat interface 452, that defines a pair of slots, shown as cargo engagement slots 454, that facilitate coupling the training seat unit 270 to the cargo floor 408 in the second position 450. The legs 274 of the seat frame assembly 272 are configured to interface with the cargo engagement slots 454 to facilitate securing the training seat unit 270 to the cargo floor 408 in the second position 450. By way of example, the cargo engagement slots 454 may include

threaded apertures that receive bolts to secure the legs 274 of the seat frame assembly 272 to the cargo seat interface 452. By way of another example, the cargo engagement slots 454 may include threaded studs extending upward therefrom that receive nuts to secure the legs 274 of the seat frame assembly 272 to the cargo seat interface 452.

According to the exemplary embodiment shown in FIGS. 19-23, the cab seat interface 252 and the cargo seat interface 452 provide discrete coupling locations that facilitate selectively repositioning the training seat unit 270 between the first position 250 and the second position 450. In other embodiments, the cab seat interface 252 and the cargo seat interface 452 are connected along a track assembly/mechanism such that the training seat unit 270 is integrated into the cab floor 208 and the cargo floor 408 and can be selectively repositioned (e.g., translated along the track, etc.) between the first position 250 and the second position 450 (e.g., through the passageway 602 of the partition 600, etc.) without having to detach and move the training seat unit 270 between the cab seat interface 252 and the cargo seat interface 452. In some embodiments, the mail tray 260 is configured to selectively engage with the cab seat interface 252 and/or the cargo seat interface 452.

Cargo Shelf Assembly

As shown in FIG. 24, the cargo compartment 402 includes a plurality of cargo shelf assemblies, shown as shelf assemblies 500, for storing and securing parcels (e.g., cargo, mail, packages, etc.) within the cargo compartment 402 during transit operations. The shelf assemblies 500 are mounted to cargo support members, shown as tracks 502, that extend along outer walls 403 of the cargo compartment 402. According to the exemplary embodiment shown in FIG. 24, the tracks 502 are logistics tracks that include a plurality of anchor points along the outer walls 403 of the cargo compartment 402 (e.g., right side wall on the right side 18 of the delivery vehicle 10, left side wall on the left side 20 of the delivery vehicle 10, etc.). The tracks 502 may be mounted to the outer walls 403 of the cargo compartment 402 using bolts, screws, rivets, or another suitable fastener, which extend through openings on either side of the tracks 502. In particular, the openings may be disposed in side flanges that extend along both sides of the tracks 502 (e.g., side flanges that extend in a substantially parallel orientation relative to the outer wall 403). As shown in FIG. 24, a central portion of each track 502 protrudes inwardly toward the hollow space or cargo area defined by the cargo compartment 402 and away from the outer walls 403 of the cargo compartment 402. In other embodiments, the tracks 502 may be flush mounted to the outer wall 403 instead of protruding inwardly from the outer wall 403.

As shown in FIG. 24, the tracks 502 are configured as A-tracks that include a plurality of rectangular shaped openings, shown as slots 504, that are spaced equally along a length of the tracks 502. The slots 504 are sized to receive mounting hardware for the shelf assemblies 500 therein. The slots 504 provide access to a hollow space between the outer walls 403 of the cargo compartment 402 and a forward surface 506 of the tracks 502. The number, shape, and size of the slots 504 may differ in various exemplary embodiments. In another embodiment, the tracks 502 are configured as E-tracks that include a tang, lip, ledge, or tab extending outwardly from a perimeter edge of the slots 504 (e.g., from the perimeter edge of the slots 504 toward the outer wall 403 of the cargo compartment 402). The additional structure included with the E-track allows for increased load capacity as compared to the A-track, but has a higher cost than the A-track. According to an exemplary embodiment, the shelf

assembly **500** is interchangeably couplable to A-track, E-track, and/or various other logistics track designs (e.g., the shelf assembly **500** may be structured to connect to both an A-track and an E-track without changing any components of the shelf assembly **500**, etc.). In other embodiments, the tracks **502** may be another track type, such as an F-track, an L-track, and/or another logistics track structure suited for anchoring and tie down within the delivery vehicle **10**. The tracks **502** may be made from galvanized and/or painted steel, aluminum, or another suitable material.

As shown in FIG. **24**, each of the tracks **502** is disposed proximate to a side wall of the cargo compartment **402** (e.g., a right side wall on the right side **18** of the delivery vehicle **10** as shown in FIG. **24**, a left side wall on the left side **20** of the delivery vehicle **10**, etc.). As shown in FIG. **24**, the tracks **502** include a first plurality of tracks **508** disposed at regular intervals along the length (e.g., front to back, etc.) of the cargo compartment **402**. Each one of the first plurality of tracks **508** extends upwardly from a lower wall **21** (e.g., floor, etc.) of the cargo compartment **402**, from a perimeter of the lower wall **21**, in substantially perpendicular orientation relative to an upper surface **23** of the lower wall **21**. In other words, each one of the first plurality of tracks **508** is arranged substantially vertically. In the embodiment of FIG. **24**, the tracks **508** are spaced at approximately equal intervals along the length of the lower wall **21**, in a direction parallel to the central axis **22** of the delivery vehicle **10**. A distance **510** between adjacent tracks of the first plurality of tracks **508** (e.g., between a centerline of adjacent tracks **508**), along the central axis **22**, corresponds to a width **511** of each individual shelf assembly **500**. In other embodiments, the spacing between the adjacent tracks of the first plurality of tracks **508** and/or the number of tracks **508** may be different.

As shown in FIG. **24**, the tracks **502** in the cargo compartment **402** includes a second plurality of tracks, shown as load retainer tracks **512**, that engage with and extend between adjacent ones of the first plurality of tracks **508**. The load retainer tracks **512** are arranged in a substantially perpendicular orientation relative to the first plurality of tracks **508** and are spaced at approximately equal intervals along the height of the outer walls **403**. As shown in FIG. **25**, the slots **504** in the load retainer tracks **512** are oriented perpendicular to a longitudinal axis of the load retainer tracks **512** such that the slots **504** in the load retainer tracks **512** are substantially aligned with a corresponding one of the slots **504** in the first plurality of tracks **508**. In some embodiments, the spacing between adjacent ones of the load retainer tracks **512**, the first plurality of tracks **508**, and/or between adjacent slots **504** within the load retainer tracks **512** or the first plurality of tracks **508**, conforms to standard spacing requirements used in semi-trucks, line haul vans, and other cargo transport vehicles. As such, the shelf assemblies **500** may be used in other applications other than the delivery vehicle **10**. Among other benefits, the combination of the first plurality of tracks **508** and the load retainer tracks **512** reinforce the cargo compartment **402** (e.g., the outer walls **403**, etc.) under externally applied loads (e.g., wind, etc.) and under the weight of the shelf assemblies **500** and parcels.

According to an exemplary embodiment, the shelf assemblies **500** can be mounted into either the first plurality of tracks **508**, the load retainer tracks **512**, or a combination thereof. The shelf assemblies **500** are height adjustable and may be connected to any of the slots along the length of the first plurality of tracks **508** or the load retainer tracks **512**. In the delivery vehicle **10** of FIG. **24**, a total of four shelf

assemblies **500** are positioned along the one of the outer walls **403** of the cargo compartment **402** and a total of two shelf assemblies **500** are positioned along the other outer wall **403** (not shown). The shelf assemblies **500** are arranged in horizontally aligned pairs along the length of the cargo compartment **402**. In other embodiments, the number and/or arrangement of the shelf assemblies **500** within the cargo compartment **402** is different.

As shown in FIG. **25**, each shelf assembly **500** includes a shelf, shown as tray **514**; a frame mount portion, shown as connector **516**; and a leveling element, shown as strap **518**. The tray **514** is hingedly coupled to the tracks **502** (e.g., the first plurality of tracks **508**) via the connectors **516** on either side of the tray **514**. A forward end **532** of the tray **514**, along both sides of the tray **514**, is connected to straps **518**. The straps **518** support the weight of the tray **514** and the weight of any parcels positioned on the tray **514**. The straps **518** may be tightened (e.g., tensioned, etc.) to rotate the tray **514** upwards toward a ceiling (e.g., upper wall) of the cargo compartment **402** (e.g., to set a height of the tray **514** at a forward end **532** of the tray **514**, to level the tray **514** with respect to the lower wall **21** of the cargo compartment **402**, etc.).

The tray **514** is sized and/or shaped to accommodate parcels within the cargo compartment **402** and to substantially prevent movement of the parcels within the cargo compartment **402** during transit operations. As shown in FIG. **25**, the tray **514** is a rectangular platform that includes a base wall **520** and a plurality of end walls **522** extending upwardly from an outer perimeter of the base wall **520**, in substantially perpendicular orientation relative to the base wall **520**. The end walls **522** together form an outer lip that substantially prevents parcels and cargo from sliding off of the shelf assemblies **500** while the delivery vehicle **10** is in motion. In other embodiments, the size and/or shape of the tray **514** may be different. For example, a base wall **520** of the tray **514** may curve upwardly at the forward end **532** to prevent the parcels from sliding across the base wall **520** while the delivery vehicle **10** is in motion (e.g., to urge parcels toward the outer wall **403** of the cargo compartment **402**, etc.). In the embodiment of FIG. **25**, the end walls **522** are formed by bending the edges of the base wall **520** at an approximately 90 degree angle and welding or otherwise connecting the end walls **522** together (e.g., via tabs that extend from either end of each end wall **522**, etc.). As such, the end walls **522** and the base wall **520** are formed together as a single unitary body. In other embodiments, the end walls **522** may be formed as separate pieces from the base wall **520** and welded to the base wall **520** and/or fastened to the base wall **520** using screws, bolts, rivets, or another suitable mechanical fastener.

As shown in FIG. **26**, the tray **514** is hingedly coupled to the tracks **502** by the connectors **516** at both sides of the tray **514** along a back end **524** of the tray **514**. The connectors **516** are detachably coupled to the track **502** via the slots **504**. According to an exemplary embodiment, the connectors **516** are snap-in couplings (e.g., clips, etc.) that engage with a perimeter edge of the slots **504** (e.g., an upper and lower edge of the slots **504**, opposing edges of the slots **504**, etc.). As shown in FIG. **26**, the connectors **516** also include a fastener **526** (e.g., a blot, screw, etc.) that prevents removal of the connector **516** from the track **502** without a separate tool (e.g., wrench, socket, etc.) to disengage the fastener **526** from the connector **516**. Among other benefits, using a fastener **526** to lock the connector **516** to the track **502** prevents inadvertent removal of the connectors **516** by the operator of the delivery vehicle **10**, thereby preventing the

trays **514** and/or other components of the shelf assembly **500** from becoming misplaced or damaged. In other embodiments, the connectors **516** are snap-on clips, latches, or other quick-connect devices that can be disassembled without a separate tool.

As shown in FIG. **26**, the end walls **522** at either side of the tray **514** include a mounting flange, shown as mounting leg **527**, that engages the connector **516**. The mounting leg **527** is integrally formed with the end wall **522** and extends upwardly from the end wall **522** at a location that is adjacent to the back end **524** of the tray **514**. As shown in FIG. **26**, each mounting leg **527** includes an opening **528** sized to receive a rotational coupling, shown as pin **530**, of the connector **516** therein. The pin **530** rotatably couples the mounting leg **527** to the connector **516** such that the tray **514** may rotate upwardly toward a ceiling of the cargo compartment **402**. The tray **514** is, therefore, rotatable between a stowed position (e.g., an upright position in which the tray **514** is raised into substantially parallel orientation relative to the outer wall **403**) and an in-use position (e.g., a lowered position in which the back end wall **522** of the tray **514** is brought into contact with the tracks **502**). As shown in FIG. **26**, the mounting leg **527** engages (e.g., contacts) the connector **516** along a side surface of the connector **516** such that the connectors **516** are disposed inboard of the mounting legs **527**. In other embodiments, the shape and/or position of the mounting legs **527** relative to the connectors **516** is different.

According to an exemplary embodiment, at least one of the tray **514** and the tracks **502** includes a bumper (e.g., a stop, a grommet, etc.) that is configured to prevent the tray **514** from damaging the outer wall **403** of the cargo compartment **402** in either the stowed or in-use position. In some embodiments, the position of the bumper is adjustable to allow a user to customize the location of the tray **514** in the stowed and/or in-use position. For example, the bumper may be threadably engaged to the tray **514** to facilitate repositioning of the bumper relative to the base wall **520**.

As shown in FIG. **24**, each shelf assembly **500** includes at least one strap **518**. The straps **518** support the weight of the tray **514**, and any parcels loaded onto the tray **514**, in the in-use position. The straps **518** also facilitate leveling of the tray **514** (e.g., positioning the tray **514** in substantially parallel orientation relative to the lower wall **21** of the cargo compartment **402**, orienting the tray **514** substantially horizontally, etc.). Additionally, the straps **518** facilitate raising the tray **514** from the in-use position to the stowed position. According to an exemplary embodiment, each shelf assembly **500** includes a pair of straps **518**, with each strap **518** positioned on an opposing side of the tray **514**. As shown in FIGS. **24** and **27-29**, each strap **518** includes a track connector, shown as T-bar connector **536**; a first strap portion, shown as first flexible tether **538**; a second strap portion, shown as second flexible tether **539**; an adjustable member or adjuster, shown as tension element **540**; and a tray connector, shown as bracket **542**. In other embodiments, each strap **518** may include additional, fewer, and/or different components.

As shown in FIG. **24**, each strap **518** extends at an oblique angle between the track **502** and the tray **514**. As shown in FIG. **27**, a first end **544** of each strap **518** is mounted to the tray **514** by the bracket **542**. The bracket **542** includes a first opening, shown as hole **545**, that is sized to receive a fastener, shown as pin **546**, therein to rotatably couple the bracket **542** to an end wall **522** of the tray **514**. As shown in FIG. **27**, the bracket **542** is rotatably coupled to a side end wall **522** of the tray **514** proximate to the forward end **532**

of the tray **514**. In other embodiments, the bracket **542** may be coupled to another portion of the tray **514** (e.g., the end wall **522** at an intermediate position between the forward end **532** and the back end **524**, half way between the forward end **532** and the back end **524**, etc.). The bracket **542** also includes a second opening, shown as slot **548**, that is positioned on an opposing end of the bracket **542** relative to the hole **545**. The slot **548** is sized to accommodate the first flexible tether **538**, which couples the bracket **542** to the tension element **540**. As shown in FIG. **27**, the first flexible tether **538** is looped through the slot **548** and secured to (e.g., looped around, anchored to, hooked to, etc.) a lower pin **550** of the tension element **540**.

As shown in FIG. **28**, a second end **552** of each strap **518** is mounted to the tracks **502** by the T-bar connector **536**. The T-bar connector **536** is detachably coupled to the tracks **502** and may be repositioned to other slots **504** within the tracks **502**. A first end **554** of the T-bar connector **536** includes a “T” shaped extension **556** that is sized to be received within the slots **504**. A second end **557** of the T-bar connector **536** includes an opening, shown as slot **558**, that is sized to accommodate the second flexible tether **539**. A user engages the T-bar connector **536** with the tracks **502** by aligning the “T” shaped extension **556** with the slots **504** and pressing the “T” shaped extension **556** into the hollow space between the tracks **502** and the outer wall **403** of the cargo compartment **402**. The user then twists the T-bar connector **536** approximately 90 degrees (e.g., in a clockwise direction, in a counterclockwise direction) to reorient the “T” shaped extension **556** perpendicular to the slots **504** and engage the “T” shaped extension **556** with the side edges of the slots **504**. The weight of the tray **514** and parcels draws the “T” shaped extension **556** against the tracks **502**, which substantially prevents rotation of the T-bar connector **536** (e.g., prevents the T-bar connector **536** from disengaging the track **502** after being installed into the slot **504**).

The second flexible tether **539** connects the T-bar connector **536** to the tension element **540**. As shown in FIG. **28**, the second flexible tether **539** is looped around and slidably engaged to the T-bar connector **536** (e.g., slot **558**) to facilitate repositioning and/or leveling of the tray **514**. As shown in FIG. **29**, a first end **560** of the second flexible tether **539** is secured to (e.g., looped around, anchored to, hooked to, etc.) an upper pin **562** of the tension element **540**. According to an exemplary embodiment, the first flexible tether **538** and the second flexible tether **539** are made from a weather-resistant webbing (e.g., polyester webbing, etc.).

According to an exemplary embodiment, the tension element **540** is a cinch cam strap buckle that includes a manually repositionable toggle **564** (e.g., clamp, cam, buckle, etc.). The toggle **564** presses against the second flexible tether **539** to pinch the strap against a lower surface of the tension element **540** (e.g., a friction bar, etc.). The force applied to the second flexible tether **539** by the toggle **564** locks the second flexible tether **539** in position and prevents the second flexible tether **539** from retracting through the tension element **540**. In other embodiments, the tension element **540** is a ratchet strap buckle or another type of adjustable strap buckle. As shown in FIG. **29**, a second end **566** (e.g., free end) of the second flexible tether **539** passes through the toggle **564** toward the forward end **532** of the tray **514**. The second end **566** of the second flexible tether **539** extends beyond the toggle **564** and away from the outer wall **403** of the cargo compartment **402**. In order to raise the forward end **532** of the tray **514**, a user pulls on the second end **566** of the second flexible tether **539** toward themselves (into the enclosed space defined by the cargo

compartment 402) and away from the outer wall 403 of the cargo compartment 402. According to an exemplary embodiment, the second end 566 of the second flexible tether 539 includes a loop (e.g., the second flexible tether 539 is looped back onto itself) to facilitate user interaction with the second flexible tether 539 when raising and lowering the tray 514. Among other benefits, the arrangement and position of the second end 566 of the second flexible tether 539 provides a user-friendly and ergonomic mechanism for repositioning (e.g., leveling, raising, etc.) the tray 514.

Door Assembly

Referring to FIGS. 30-48 generally, the side door assembly 700 is shown in additional detail. As explained above, the side door assembly 700 includes the driver cab door 800 and the side cargo door 1000 that together extend along the right side 18 of the body 100 and selectively permit access into the delivery vehicle 10. The driver cab door 800 and the side cargo door 1000 are slidably coupled to body 100 and each independently movable along parallel guide rails having tracks that extend both above and below the right cab opening 204 and the side cargo opening 404. By sliding rather than rotating about hinges, the driver cab door 800 and the side cargo door 1000 provide significantly less interference for a person or object moving into or out of the delivery vehicle 10. For example, when the side cargo door 1000 is in the open position, a person or object has nearly unobstructed access to the entire side cargo opening 404. While traditional hinged doors may require a person or object to be moved into or out of the cargo compartment 402 at an angle, the side door assembly 700 avoids these problems by eliminating potential sources of interference. Additionally, the side door assembly 700 reduces the lateral footprint of the delivery vehicle 10. The reduced lateral footprint of the delivery vehicle 10 allows the improved transfer of items into and out of the cargo compartment 402 or the driver compartment 202 by allowing the delivery vehicle 10 to park closer to mailboxes and other parcel transfer points, for example. According to an exemplary embodiment, the side door assembly 700 is contained entirely between the front axle 60 and the rear axle 64. In addition, the overlapping nature of the driver cab door 800 and the side cargo door 1000 restricts use of the delivery vehicle 10 before each of the driver cab door 800 and the side cargo door 1000 within the side door assembly 700 have been returned to their respective closed and secured positions (e.g., if the side cargo door 1000 is open, the operator cannot open the driver cab door 800 to get into the cab 200 and, therefore, ensures the side cargo door 1000 is not left open inadvertently while driving).

Referring specifically to FIGS. 30-33, the configuration and operation of the side door assembly 700 is depicted. As explained above, the side door assembly 700 includes the driver cab door 800 and the side cargo door 1000 that are each slidably coupled to one or more guide rails 702, 704 that extend along the body 100 of the delivery vehicle 10. In some examples, a first guide rail 702 extends along the body 100, above and across each of the right cab opening 204 and the side cargo opening 404. The first guide rail 702 can be integrally formed within or otherwise mounted (e.g., fastened, welded, glued, etc.) to the body 100. As shown in FIGS. 30 and 39, the first guide rail 702 extends from the A-pillar 112, across the B-pillar 114, and to the C-pillar 116 on the right side 18 of the body 100. Similarly, the second guide rail 704 extends along the body 100, below and across each of the right cab opening 204 and the side cargo opening 404. As shown in FIG. 39, fasteners 706 can be used to

mount the second guide rail 704 to steps 708, 710 that extend beneath and across the right cab opening 204 and the side cargo opening 404, respectively.

The first guide rail 702 and second guide rail 704 collectively define the movement of the driver cab door 800 and the side cargo door 1000 relative to the body 100 and relative to the right cab opening 204 and side cargo opening 404. The first guide rail 702 and the second guide rail 704 define two parallel and laterally offset tracks 712, 714 to separately receive the driver cab door 800 and the side cargo door 1000 and allow relative motion between the driver cab door 800 and the side cargo door 1000 about parallel axes. As shown in FIGS. 30, 32, and 33, each of the driver cab door 800 and the side cargo door 1000 are movable between multiple positions. In FIG. 30, for example, the driver cab door 800 and the side cargo door 1000 are each in a “closed position.” In the “closed” or first position, the driver cab door 800 extends across the right cab opening, from the B-pillar 114 to the A-pillar 112 to effectively seal off and cover the right cab opening 204 so that movement into and out of the driver compartment 202 is restricted.

The driver cab door 800 can be opened to allow a driver to enter or exit the driver compartment 202 of the body 100. To access the driver compartment 202, the driver cab door 800 can slide rearward along the first guide rail 702 and the second guide rail 704 toward an “open,” or second position, as shown in FIG. 32. Because the driver cab door 800 and the side cargo door 1000 are received within separate and offset tracks 712, 714 within the guide rails 702, 704, the driver cab door 800 and the side cargo door 1000 can move independently of one another. As the driver cab door 800 is urged backward along the guide rails 702, 704, the door panel 802 no longer spans across the entire right cab opening 204. The driver cab door 800 can be moved rearward, behind the side cargo door 1000, until the driver cab door 800 engages a stop. In some examples, the stop is positioned within one or both of the first and second guide rails 702, 704. Alternatively, the stop can be created by interference between a handle assembly 750 and the side cargo door 1000. The stop prevents continued rearward movement of the driver cab door 800, and defines the fully open or second position. In the second position, the driver cab door 800 is offset from the right cab opening 204 but extends across at least a portion of the side cargo opening 404. In the second position, the door panel 802 is offset rearward so that at least half (e.g., about 70%) of the door panel 802 extends rearward of the B-pillar 114. In some examples, the stop includes a releasable locking mechanism that is coupled to the B-pillar 114 to hold the driver cab door 800 in the fully open position. As explained below, the locking mechanism can be unlocked by actuating the first handle assembly 750.

Like the driver cab door 800, the side cargo door 1000 can also be moved along the first and second guide rails 702, 704 between multiple positions. As shown in FIG. 30, the side cargo door 1000 is in a “closed” or third position. In the closed position, the side cargo door 1000 extends across the side cargo opening 404, from the B-pillar 114 to the C-pillar 116 to effectively seal off and cover the side cargo opening 404 so that movement into and out of the cargo compartment 402 is restricted. When the driver cab door 800 and the side cargo door 1000 are both in the closed position (e.g., the first and third positions), the side cargo door 1000 overlaps a portion (e.g., about 5%) of the driver cab door 800.

The side cargo door 1000 can also be opened to allow a driver or worker to enter or exit the cargo compartment 402 of the cargo body 400 through the side cargo opening 404. To access the cargo compartment 402, the side cargo door

1000 can slide forward along the first guide rail 702 and the second guide rail 704 toward an “open,” or fourth position, as shown in FIG. 33. Because the driver cab door 800 and the side cargo door 1000 are received within separate and offset tracks 712, 714 within the guide rails 702, 704, the side cargo door 1000 can move independently of the driver cab door 800 forward, toward the front axle 60. As the side cargo door 1000 is urged forward along the guide rails 702, 704, a door panel 1002 of the side cargo door 1000 no longer spans across the entire side cargo opening 404, and instead extends across a portion of the right cab opening 204, which may already be covered by the driver cab door 800. The side cargo door 1000 can be moved forward, over the driver cab door 800, until the side cargo door 1000 engages a stop. In some examples, the stop is positioned within one or both of the first and second guide rails 702, 704. Alternatively, the stop can be created by interference between a handle assembly 750 and the side cargo door 1000. The stop prevents continued forward movement of the side cargo door 1000, and defines the fully open or fourth position. In the fourth position, the side cargo door 1000 is offset forward from the side cargo opening 404 but may extend across at least a portion of the side cargo opening 404. In the fourth position, the door panel 1002 is offset forward so that at least half (e.g., about 70%) of the door panel 1002 extends forward and beyond the B-pillar 114. In some examples, the stop includes a releasable catch mechanism that is mounted to one of the driver cab door 800 or the B-pillar 114 to prevent the side cargo door 1000 from transitioning away from the fourth, fully open position unless actuated (e.g., by the second handle assembly 752, explained below).

Referring to FIG. 34, the first guide rail 702 is shown in additional detail. The first guide rail 702 generally includes a support partition 720 that receives and secures two angled members 722, 724 that together form the first track 712 and the second track 714. The support partition 720 has a flat guiding section 726 and a mounting flange 728 extending (e.g., perpendicularly) away from the guiding section 726. In some examples, the mounting flange 728 defines apertures (not shown) that can be used to secure the support partition 720 and first guide rail 702, more generally, to the body 100. In some examples, the mounting flange 728 can also be used to couple the angled members 722, 724 to the support partition 720.

The angled members 722, 724 each generally include a flat upper surface 730, 732, a wall 734, 736 extending perpendicularly away from the flat upper surface 730, 732, and a V-shaped trough 738, 740 extending inward from an end of the wall 734, 736 opposite the flat upper surface 730, 732. In some examples, the wall 734 of the first angled member 722 is taller (e.g., the wall 734 extends downward further) than the wall 736 of the second angled member 724. Accordingly, the v-shaped trough 738 of the first angled member 722 sits lower than the v-shaped trough 740 of the second angled member 724. The flat upper surface 730, 732, the wall 734, 736, and the v-shaped trough 738, 740 each extend an entire length of the respective angled member 722, 724.

The v-shaped troughs 738, 740 and the walls 734, 736 define the first track 712 and the second track 714, and allow the driver cab door 800 and the side cargo door 1000 to slide along the body 100. Each of the driver cab door 800 and the side cargo door 1000 include roller assemblies 780, 782 that are received within and movable along the tracks 712, 714. As shown in FIG. 34, a first roller assembly 780 coupled to the driver cab door 800 is received within the v-shaped trough 738 of the first angled member 722. The first roller

assembly 780 includes a mounting plate 784 that extends upward from a top of the door panel 802. The mounting plate 784 supports eyelet plates 786. The eyelet plates 786 each receive a roller shaft 788 that includes a wheel 790 positioned at a distal end thereof. The wheel 790 is configured to roll within the v-shaped trough 738. The sloped edges of the v-shaped trough 738 direct the wheel 790 and the first roller assembly 780, more generally, within the first track 712. In some examples, a secondary wheel 792 extends upwardly from the driver cab door 800. The secondary wheel 792 rolls along the wall 734, and rotates about an axis perpendicular to an axis of the wheel 790. Similar structures can be used on the top of the side cargo door 1000 to interact with the second track 714. Additionally, similar roller assemblies 780, 782 can be coupled to the bottoms of the driver cab door 800 and the side cargo door 1000 to interact with the second guide rail 704.

With additional reference to FIGS. 34-37, a sealing arrangement 820 within the side door assembly 700 is shown in additional detail. The sealing arrangement 820 is generally formed of one or more resilient seals 822, 824, 826 that extend along the external edges and interfaces formed between different components of the side door assembly 700. For example, the seal 822 partially surrounds and extends along a length of the support partition 720. The seal 822 includes a lip 828 that can interact with the driver cab door 800, for example, to restrict or prevent fluid flow between the first guide rail 702 and the driver cab door 800 which may otherwise reach the driver compartment 202.

In some examples, the sealing arrangement 820 includes a main fluid seal 826 positioned between the driver cab door 800 and the side cargo door 1000. A seal carrier 830 is coupled to a rearward edge of the door panel 802, and extends along at least a portion of the height (e.g., the entire height) of the driver cab door 800. The seal carrier 830 includes a mounting portion 832 and a retainer portion 834. The mounting portion 832 is defined by a flat, flange-like surface that extends along the driver cab door 800. The mounting portion 832 can be adhesively coupled to the driver cab door 800, for example. In some embodiments, the mounting portion 832 extends along both the door panel 802 and the window assembly 900 of the driver cab door 800. The retainer portion 834 angles away from the mounting portion 832 and the driver cab door 800 to form an angled seat. The main fluid seal 826 can be adhesively coupled to the seal carrier 830 and extends along one or more of the retainer portion 834 and the mounting portion 832.

When each of the driver cab door 800 and the side cargo door 1000 are in the closed positions, the main fluid seal 826 is compressed between the driver cab door 800 and the side cargo door 1000. To receive and interact with the main fluid seal 826, the side cargo door 1000 includes a resilient nose 1004 and pocket 1006 defining a forward portion of the door panel 1002. The nose 1004 bends inwardly, away from the generally flat outer surface of the door panel 1002 and toward the driver cab door 800. In some examples, the nose 1004 extends approximately parallel (e.g., within about 20 degrees) to the retainer portion 834 of the seal carrier 830. The pocket 1006 is formed behind the nose 1004, and is configured to receive and interface with a portion of the main fluid seal 826. The nose 1004 is at least partially defined by a cantilevered segment 1008 that is bent into the door panel 1002. When the driver cab door 800 and the side cargo door 1000 are urged toward (or secured in) their closed positions, the main fluid seal 826 is received within the pocket 1006 of the door panel 1002 and the retainer portion 834 of the seal carrier 830. The main fluid seal 826

is compressed by the cantilevered segment **1008** and the nose **1004**, generally, which causes the main fluid seal **826** to expand between the driver cab door **800** and the side cargo door **1000** so that fluid is restricted from passing into the body **100** through the interface formed between the driver cab door **800** and the side cargo door **1000** within the side door assembly **700**. The placement of the main fluid seal **826** is such that the main fluid seal **826** does not inhibit rearward motion of the driver cab door **800** toward the open position or forward motion of the side cargo door **1000** toward the open position.

Referring now to FIGS. **31**, **37**, and **38**, the side door assembly **700** includes an opening mechanism **748** including two handle assemblies, a first handle assembly **750** and a second handle assembly **752**. The first handle assembly **750** is coupled to the driver cab door **800** proximate a forward edge of the door panel **802** and includes an interior handle **754** and an exterior handle **756**. As shown in FIG. **38**, the interior handle **754** includes a lever **758** that rotates relative to a latching mechanism **760** mounted along an inside of the door panel **802**. The lever **758** is rotatably mounted to the latching mechanism **760** on a proximal end and includes a gripping portion or section **762** including a finger loop **764** and a thumb rest **766** formed on a distal end thereof. Rotation of the lever **758** (e.g., by applying a rearward force using the gripping section **762**) relative to the latching mechanism **760** releases and decouples a locking latch **768** of the door locking assembly **1200** from the latching mechanism **760**. With the locking latch **768** released from the latching mechanism **760**, the driver cab door **800** can slide away from the closed, first position to the second, open position. Urging the driver cab door **800** forward from the second, open position toward the first, closed position can urge the locking latch **768** into engagement with the latching mechanism **760** to releasably secure the driver cab door **800** in the closed position. In some examples, the door locking assembly **1200** can be selectively locked in a way that prevents the locking latch **768** from decoupling with the latching mechanism **760**. Because the door locking assembly **1200** is mounted to the body **100** rather than to the driver cab door **800**, the selective coupling formed between the door locking assembly **1200** and the latching mechanism **760** prevents rearward movement of the driver cab door **800** relative to the body **100** to secure the driver cab door **800** in the first, closed position.

The exterior handle **756** can also be coupled to the latching mechanism **760**. In some examples, the exterior handle **756** includes an arcuate handle shaft, shown as handle shaft **770**, extending away from a front portion of the door panel **802**. The handle shaft **770** can include a grip **772** formed on a distal end of the handle shaft **770**, away from the coupling formed between the handle shaft **770** and the latching mechanism **760**. Rotation of the exterior handle **756** relative to the driver cab door **800** can similarly cause rotation of the latching mechanism **760**, which again releases and decouples the locking latch **768** of the door locking assembly **1200** and releases the door panel **802**. Once decoupled from the door locking assembly **1200**, the driver cab door **800** can be slid rearward toward the second, open position about the first guide rail **702** and the second guide rail **704**. The first handle assembly **750** is positioned forward along the door panel **802** so that the first handle assembly **750** is positioned forward of the side cargo door **1000** when the side cargo door **1000** is in its open, fourth position.

The second handle assembly **752** is coupled to the side cargo door **1000**. As shown in FIGS. **30** and **31**, the second

handle assembly **752** is positioned proximate the rear edge of the side cargo door **1000** and is vertically (i.e., upwardly) offset from the first handle assembly **750**. As shown in FIG. **33**, a latching mechanism **774** mounted to the inside of the C-pillar **116** selectively couples with the second handle assembly **752** to restrict forward movement of the side cargo door **1000** from the third, closed position to the fourth, open position. When unlocked, rotating an external lever **776** of the second handle assembly **752** decouples the second handle assembly **752** from the latching mechanism **774** so that the side cargo door **1000** can slide forward, about the first guide rail **702** and the second guide rail **704**.

The components and structure of the side door assembly **700** allows the side door assembly **700** to be installed onto the body **100** of the delivery vehicle **10** in a much faster and easier way than traditional door assemblies. With reference now to FIGS. **39-48**, a rapid assembly process is described in detail.

During an initial step in the build of the delivery vehicle **10** shown in FIG. **39**, the first guide rail **702** and the second guide rail **704** are installed. As explained above, the first guide rail **702** extends above and across each of the right cab opening **204** and the side cargo opening **404**. The first guide rail **702** is mounted to (e.g., fastened, welded, glued, etc.) the body **100** so that the first guide rail **702** extends from the A-pillar **112**, across the B-pillar **114**, and to the C-pillar **116** on the right side **18** of the body **100**. The second guide rail **704** is installed in a similar manner. The second guide rail **704** extends below and across each of the right cab opening **204** and the side cargo opening **404**, and spans the distance from the A-pillar **112**, across the B-pillar **114**, and to the C-pillar **116**. The second guide rail **704** can be mounted to the steps **708**, **710** and the B-pillar **114** using several fasteners **706**. In some examples, the second guide rail **704** can act as an intermediate or lower step that allows a driver or worker to step on the second guide rail **704** prior to climbing onto either of the steps **708**, **710** or into the cargo compartment **402** and/or the driver compartment **202**. As detailed in FIG. **39**, when the first guide rail **702** is initially installed, each of the first (and inner) track **712** and the second (and outer) track **714** may extend along only a portion of the length of the first guide rail **702**.

After the guide rails **702**, **704** have been installed onto the body **100**, the driver cab door **800** can be installed onto the first tracks **712** of the first guide rail **702** and the second guide rail **704**, as shown in FIG. **40**. The driver cab door **800** is initially loaded onto the guide rails **702**, **704** near the side cargo opening **404**. Because the first and second tracks **712**, **714** do not yet extend the entirety of the guide rails **702**, **704**, the upper portion of the driver cab door **800** can be raised above first guide rail **702** initially during install. The driver cab door **800** can extend into the cargo compartment **402**, which allows an assembler to position the bottom of the door panel **802** within the first track **712** of the second guide rail **704**. With the lower roller assembly **780** of the door panel **802** received within the first track **712** of the second guide rail **704**, the driver cab door **800** can be slid forward. As the driver cab door **800** slides forward along the guide rails **702**, **704**, the upper roller assembly **780** of the door panel **802** enters and begins to travel within the shortened first track **712** of the first guide rail **702**. The driver cab door **800** can be pushed forward, to the first, closed position.

With the driver cab door **800** installed and moved to the first, closed position, the remaining pieces of the first track **712** can be installed into the first guide rail **702**. As depicted in FIGS. **41** and **42**, the remaining pieces of the first track **712** may be the support partition **720** and the first angled

member 722 (seen in FIG. 34). In some examples, the mounting flange 728 of the support partition 720 is used to mount each of the support partition 720 and first angled member 722 to the first guide rail 702 and to the body 100, generally. With the support partition 720 and the first angled member 722 installed onto the first guide rail 702, the first track 712 is complete, thereby allowing full sliding motion of the driver cab door 800 between the fully open and fully closed positions.

Once the first track 712 has been fully assembled on the first guide rail 702, the side cargo door 1000 can be installed, as depicted in FIG. 43. Like the installation of the driver cab door 800, the side cargo door 1000 is initially loaded onto the guide rails 702, 704 near the side cargo opening 404. Because the second track 714 does not yet extend the entirety of the guide rails 702, 704, the upper portion of the side cargo door 1000 can be raised above first guide rail 702 initially during install. The side cargo door 1000 can extend into the cargo compartment 402, which allows an assembler to position the bottom of the door panel 1002 within the second track 714 of the second guide rail 704. With the lower roller assembly 780 of the door panel 1002 received within the second track 714 of the second guide rail 704, the side cargo door 1000 can be slid forward. As the side cargo door 1000 slides forward along the guide rails 702, 704, the upper roller assembly 780 of the door panel 1002 enters and begins to travel within the shortened second track 714 of the first guide rail 702, and overlaps the driver cab door 800.

The side cargo door 1000 is then slid forward within the second tracks 714 until it reaches the stop at the open, fourth position, shown in FIG. 44. As indicated above, the side cargo door 1000 can include a releasable catch mechanism that is mounted to one of the driver cab door 800 or the B-pillar 114 to prevent the side cargo door 1000 from transitioning away from the fourth, fully open position unless actuated (e.g., by the second handle assembly 752, explained above).

With the side cargo door 1000 secured in the fourth, open position, the remaining portions of the second track 714 can be installed onto each of the guide rails 702, 704. As depicted in FIGS. 44-46, additional guiding components can be secured to the guide rails 702, 704. For example, the second angled member 724 can be coupled to the support partition 720 or directly to the first guide rail 702 to extend the second track 714 along a full length of the first guide rail 702. With the second angled member 724 installed, the top roller assembly 780 of the side cargo door 1000 can move the side cargo door 1000 between the fully-open, fourth position and the fully-closed, third position within the second track 714. As shown in FIG. 46, a spacer plate 746 can be installed along the rear section of the second guide rail 704. The spacer plate 746 can extend across a portion of the second guide rail 704 to protect the second guide rail 704 from being inadvertently stepped on or damaged. In some examples, the spacer plate 746 shields the lower roller assembly 780 of the driver cab door 800 and separates the two tracks 712, 714 of the second guide rail 704. With the spacer plate 746 and the second angled member 724 installed, the side cargo door 1000 can be slid rearward to the third, closed position shown in FIG. 47. To release the side cargo door 1000 from the fully open position, a user can actuate the second handle assembly 752.

Finally, with each of the driver cab door 800 and the side cargo door 1000 installed, guide rail covers 810 can be secured to the body 100. As shown in FIGS. 47 and 48, the guide rail covers 810 extend above the first guide rail 702 and overhang at least a portion of the driver cab door 800

and the side cargo door 1000. The guide rail covers 810 can help provide additional sealing and further restrict the travel of unwanted liquids or contaminants into the cargo compartment 402 or the driver compartment 202. In some examples, the guide rail covers 810 are curved or flat panels that are bolted or otherwise secured to one or more of the A-pillar 112, B-pillar 114, or C-pillar 116. In some examples, the guide rail covers 810 can extend to and be coupled with a roof 118 of the body 100.

Using the above-described delivery vehicle 10 and the side door assembly 700, various advantages over conventional delivery vehicles are achieved. The sliding nature of the side door assembly 700 increases the clearance relative to the right cab opening 204 and the side cargo opening 404, and maximizes the available space for moving into and out of the driver compartments 202 and the cargo compartment 402 of the delivery vehicle 10. The overlapping design of the side door assembly 700 restricts and helps to avoid operating the delivery vehicle 10 with the side cargo door 1000 ajar, since the driver will be largely obstructed from traveling into the driver compartment 202 when the side cargo door 1000 is open. As explained above, the side door assembly 700 is much easier to install into the delivery vehicle 10 than other conventional door mechanisms.

Window Assembly

Referring particularly to FIGS. 49-57, the window assembly 900 is shown in greater detail, according to an exemplary embodiment. The window assembly 900 can be positioned or configured for a driver's side or a passenger side of the delivery vehicle 10 (e.g., the right side 18 of the delivery vehicle 10 or the left side 20 of the delivery vehicle 10), or both. While the window assembly 900 is positioned on the right side 18 of the delivery vehicle 10 in the exemplary embodiment shown in FIGS. 49-57, it should be understood that the window assembly 900 may be symmetrically positioned on an opposite side of the delivery vehicle 10 (e.g., on the left side 20 of the delivery vehicle 10) or on both the left side 20 and the right side 18 of the delivery vehicle 10.

The window assembly 900 includes a first window, a first portion, a translatable window, etc., shown as movable window 902, and a second window, a second portion, a stationary window, etc., shown as fixed window 904. The movable window 902 can be configured to roll, translate, rotate, pivot, etc., or otherwise move relative to the fixed window 904. The movable window 902 and the fixed window 904 can be manufactured from a same or similar material (e.g., glass, plexi-glass, plastic, etc.) that at least partially allows light to transfer through. For example, the movable window 902 and/or the fixed window 904 can be transparent, translucent, opaque, etc. In some embodiments, one or both of the movable window 902 and the fixed window 904 are tinted on an exterior surface so that the operator can view exterior landscape, objects, environment, etc., through the movable window 902 and/or the fixed window 904 but prevent, limit, or otherwise obscure a view of the operator or interior of the cab 200 from outside the cab 200.

As shown in FIGS. 49-53 and 57, the movable window 902 and the fixed window 904 are coupled with the door panel 802. The fixed window 904 is fixedly coupled (e.g., mounted, secured, fastened, sealed, etc.) with the door panel 802 such that the fixed window 904 does not translate, rotate, or pivot relative to the door panel 802. The movable window 902 is translatable coupled with the door panel 802 (e.g., along one or more tracks, through an inner volume of the door panel 802, etc.) so that the movable window 902 can translate relative to the door panel 802 and the fixed

window 904. The movable window 902 may be transitionable between a first position (e.g., a closed position as shown in FIGS. 49-53) and a second position (e.g., an open position) or a position partially between the first position and the second position (e.g., a partially open or a partially closed position). When the movable window 902 is in the second position, an aperture or opening is formed so that the operator can access the exterior environment (e.g., to deliver packages, mail, etc.). When the movable window 902 is in the first position, access to the external environment or area surrounding the delivery vehicle 10 is limited by the movable window 902. The movable window 902 can be transitioned between the first position and the second position by an electric motor (e.g., a window motor) or a crank mechanism that is driven by the operator or a user.

As shown in FIGS. 49-54, the fixed window 904 is fixedly coupled along a forwards or front edge with one of the A-pillars 112. The fixed window 904 can also be fixedly coupled along a corresponding edge of the driver cab door 800 with a panel 912 that is positioned proximate the A-pillar 112 (e.g., when the driver cab door 800 is closed). The fixed window 904 fixedly couples along a rear or opposite edge of the driver cab door 800 proximate the B-pillar 114 (e.g., when the driver cab door 800 is closed). The fixed window 904 is fixedly coupled along an upper edge with an upper frame member 914. In this way, the fixed window 904 extends between the A-pillar 112, the B-pillar 114, and the upper frame member 914 (e.g., when the driver cab door 800 is closed). The fixed window 904 may seal along at least a portion of its perimeter through seal 910.

The fixed window 904 defines an aperture, an opening, a passage, a hole, etc., shown as opening 916. The opening 916 can have a shape corresponding to a shape of the movable window 902. The opening 916 is defined by an interior edge 918 of the fixed window 904 that extends from the rear edge of the driver cab door 800 to the panel 912 or the door panel 802 proximate the front end of the driver cab door 800.

The movable window 902 and the fixed window 904 are sealingly coupled with each other (e.g., when the movable window 902 is in the first position) through a rail, an annular member, a rim member, a division bar, etc., shown as seal 906. The seal 906 extends along the interior edge 918 of the fixed window 904 between the rear end of the driver cab door 800 and the panel 912 or the door panel 802. The movable window 902 may seal with the fixed window 904 through the seal 906 when the movable window 902 is in the first position. The seal 906 can be fixedly coupled with the fixed window 904 so that the movable window 902 translates into and out of engagement with the seal 906.

As shown in FIG. 51, the movable window 902 may transition out of the first position (as shown in FIG. 51) to the second position by translating in a direction 908 relative to fixed window 904. The direction 908 may be a substantially downwards direction so that the movable window 902 translates into the door panel 802. The door panel 802 can receive the movable window 902 as the movable window 902 translates into the second position. When the movable window 902 moves in the direction 908, the movable window 902 translates out of engagement with the seal 906.

Referring particularly to FIGS. 54-56, the seal 906 is shown in greater detail, according to an exemplary embodiment. The seal 906 includes a body 930. The body 930 of the seal 906 defines a groove, a channel, a recess, a track, etc., shown as interior channel 920. The interior channel 920 is configured to receive a corresponding portion, edge, area, etc., of the movable window 902 as the movable window

902 translates between the first position and the second position. When the movable window 902 translates into the first position, an upper portion 928 of the movable window 902 translates into the interior channel 920 to seal the movable window 902 with the fixed window 904. The body 930 defines one or more sealing members, protrusions, ribs, etc., shown as sealing portions 924. The sealing portions 924 are positioned within the interior channel 920. The sealing portions 924 extend inwards so that when the movable window 902 is translated into the first position, the sealing portions 924 engage opposite surfaces of the upper portion 928 of the movable window 902. The sealing portions 924 engage the opposite surfaces of the upper portion 928 to seal the movable window 902 with the fixed window 904. Advantageously, the movable window 902 is selectably sealable with the fixed window 904 as the movable window 902 translates between the first position and the second position. The sealing portions 924 and the interior channel 920 can extend along substantially an entire length of the body 930.

An exterior surface 922 of the body 930 may sealingly couple with a corresponding portion or surface 926 of the fixed window 904. In some embodiments, an adhesive is applied to one or both of the exterior surface 922 of the body 930 and/or a corresponding interior surface 926 of the fixed window 904.

Referring particularly to FIG. 57, the movable window 902 may be translatable into the second position. When the movable window 902 is translated into the second position relative to the fixed window 904, the movable window 902 translates into an inner volume 936 of the door panel 802. The door panel 802 includes a first member 932 and a second member 934 (e.g., a pair of sidewalls) that are positioned apart from each other and define the inner volume 936. The movable window 902 can translate into the inner volume 936 of the door panel 802 when driven or repositioned into the second position.

Advantageously, the fixed window 904 and the movable window 902 provide a wider field of view for the operator for increased viewing area of areas external to the delivery vehicle 10. In some embodiments, the seal 906 has a less than 3 degree of visibility obstruction (e.g., due to a width of the seal 906). The fixed window 904 and the movable window 902 as shown in FIGS. 49-57 can provide an improved visibility relative to traditional windows (e.g., up to a 135 degrees of visibility or a viewing area of 135 degrees, etc.).

Door Locking Assembly

Referring to FIGS. 7 and 58-62, the door locking assembly 1200 (e.g., a locking cylinder assembly) is shown according to an exemplary embodiment. The door locking assembly 1200 is configured to selectively prevent a door (e.g., the driver cab door 800, the side cargo door 1000, another door of the delivery vehicle 10, etc.) from moving out of the closed position (e.g., toward the open position). Specifically, the door locking assembly 1200 is configured to receive a key or opener, shown as key 1202. One or more keys 1202 may be distributed among one or more authorized users. When the key 1202 is fully inserted into the door locking assembly 1200, the door locking assembly 1200 may be reconfigured between (a) a locked configuration in which the door locking assembly 1200 prevents the corresponding door from moving away from the closed position and (b) an unlocked configuration in which the door locking assembly 1200 permits free movement of the door between the closed position and the open position. Specifically, when the key 1202 is inserted into a key aperture 1204 of the door

locking assembly **1200**, a portion of the door locking assembly **1200** is configured to rotate between a locked position (e.g., a locked orientation) corresponding to the locked configuration and an unlocked position (e.g., an unlocked orientation) corresponding to the unlocked configuration. The key **1202** moves into the door locking assembly **1200** along and rotates about a longitudinal axis **1206**. In some embodiments, the door locking assembly **1200** is generally radially symmetrical about the longitudinal axis **1206**.

In some situations, unauthorized users will attempt to access to the interior of the delivery vehicle **10** (e.g., the driver compartment **202** or the cargo compartment **402**) without a key **1202**. This type of intrusion may take the form of a user applying a force or torque on the door locking assembly **1200** in an attempt to break a component of the door locking assembly **1200** and gain access to the interior of the delivery vehicle **10**. By way of example, a user may attempt to insert a torque transmission device, such as a screwdriver, into the key aperture **1204**. The user may then attempt to apply a torque to the door locking assembly **1200** until the door locking assembly **1200** fails and moves to the unlocked orientation. By way of another example, a user may attempt to grasp an exterior surface of the door locking assembly **1200** (e.g., using a pair of pliers). The user may then attempt to apply a torque to the door locking assembly **1200** until the door locking assembly **1200** fails and moves to the unlocked orientation. As described in further detail herein, the delivery vehicle **10** includes a series of features that resist these and other methods of unauthorized access to the interior of the delivery vehicle **10**.

As shown in FIG. 7, the door locking assembly **1200** is coupled (e.g., directly) to the cab **200** and positioned on the right side of the delivery vehicle **10**. The door locking assembly **1200** is positioned forward of the driver cab door **800** and at approximately the same height as the door panel **802**. The door locking assembly **1200** is positioned below and approximately in line with the A-pillar **112**. The door locking assembly **1200** is positioned below all of the windows of the delivery vehicle **10**. In some embodiments, the door locking assembly **1200** is positioned near waist height of a user standing on the ground adjacent the delivery vehicle **10**. In other embodiments, the door locking assembly **1200** is otherwise positioned along the body **100**. By way of example, the door locking assembly **1200** may be coupled to the driver cab door **800**, the side cargo door **1000**, or the cargo body **400**.

Referring to FIGS. 61-63, the door locking assembly **1200** includes a housing or outer component, shown as lock body **1210**. The lock body **1210** is coupled to the body **100** of the delivery vehicle **10**. Specifically, the lock body **1210** is fixedly coupled (e.g., fastened) to the body **100** such that relative movement between the lock body **1210** and the body **100** is limited (e.g., prevented). The lock body **1210** includes a cylindrical portion, shown as main body **1211**, that is substantially centered about the longitudinal axis **1206**. Extending radially outward from the main body **1211** are a series of protrusions or projections, shown as mounting protrusions **1212**. The mounting protrusions **1212** are fixedly coupled to (e.g., integrally formed with, fastened to, adhered to, etc.) the main body **1211**. The mounting protrusions **1212** are configured to engage the body **100** to limit rotation of the lock body **1210** about the longitudinal axis **1206** and movement of the lock body **1210** along the longitudinal axis **1206** relative to the body **100**. The main body **1211** defines a longitudinal aperture, shown as lock body aperture **1214**. The lock body aperture **1214** extends longitudinally through the main body **1211** and is approxi-

mately centered about the longitudinal axis **1206**. The main body **1211** further defines a pair of radial apertures or shear member apertures, shown as retaining pin apertures **1216**. As shown, the retaining pin apertures **1216** are diametrically opposed to one another and extend from an outer surface of the main body **1211** to the lock body aperture **1214**. A protrusion, shown as spring bar **1218**, is fixedly coupled to the main body **1211**. The spring bar **1218** is offset from the longitudinal axis **1206** and extends longitudinally rearward from the main body **1211**.

Referring to FIGS. 63-69, the door locking assembly **1200** further includes a sleeve or spacer (e.g., a tumbler engagement sleeve), shown as sleeve **1220**. The sleeve **1220** is substantially cylindrical and substantially centered about the longitudinal axis **1206**. The sleeve **1220** is received within the lock body aperture **1214**. In some embodiments, an outer diameter of the sleeve **1220** is slightly smaller than an inner diameter of the lock body aperture **1214** to provide a slip fit between the sleeve **1220** and the lock body **1210**, limiting movement of the sleeve **1220** perpendicular to the longitudinal axis **1206**. The sleeve **1220** defines a longitudinal aperture, shown as sleeve aperture **1222**. The sleeve aperture **1222** extends longitudinally through the sleeve **1220** and is approximately centered about the longitudinal axis **1206**. The sleeve aperture **1222** is configured to receive a tumbler assembly, shown as core assembly **1230**. The sleeve **1220** further defines a pair of radial apertures or shear member apertures, shown as retaining pin apertures **1223**. As shown, the retaining pin apertures **1223** are diametrically opposed to one another and extend from an outer surface of the sleeve **1220** to the sleeve aperture **1222**.

Extending radially outward from the sleeve aperture **1222** are two sets of grooves or recesses, shown as unlock grooves **1224** and lock grooves **1225**. As shown, the sleeve **1220** includes two unlock grooves **1224** arranged diametrically opposed from one another and two lock grooves **1225** arranged diametrically opposed from one another. In other embodiments, the sleeve **1220** defines more or fewer grooves (e.g., only one unlock groove **1224** and one lock groove **1225**, no unlock grooves **1224**, etc.). The unlock grooves **1224** and the lock grooves **1225** extend longitudinally along the length of the sleeve aperture **1222**. The unlock grooves **1224** and/or the lock grooves **1225** may be continuous along their length and/or have a constant cross-sectional area long their length. In other embodiments, the unlock grooves **1224** and/or the lock grooves **1225** include multiple segments arranged along the length of the sleeve **1220**.

Referring to FIGS. 63, 65, 70, and 71, the core assembly **1230** is shown according to an exemplary embodiment. The core assembly **1230** is configured to be selectively fixed relative to the sleeve **1220**. Specifically, when the key **1202** is not fully inserted or the wrong key is inserted into the core assembly **1230**, the core assembly **1230** is configured to limit (e.g., prevent) rotation of the core assembly **1230** relative to the sleeve **1220**. When the key **1202** configured for use with the core assembly **1230** is fully inserted, the key **1202** can be rotated to freely rotate the core assembly **1230** relative to the sleeve **1220**, moving the door locking assembly **1200** between the locked configuration and the unlocked configuration.

The core assembly **1230** includes a main body, shown as core cylinder **1232**, that extends longitudinally through the door locking assembly **1200**. A series of wafers or pins, shown as tumblers **1234**, are slidably coupled to the core cylinder **1232**. The tumblers **1234** are configured to move radially relative to the core cylinder **1232** between an

extended position, shown in FIG. 70, and a retracted position, shown in FIG. 71. In the extended position, the tumblers 1234 extend into the unlock grooves 1224 or the lock grooves 1225 such that the tumblers 1234 engage the sleeve 1220 to limit rotation of the core assembly 1230 relative to the sleeve 1220. In the retracted position, the tumblers 1234 are retracted into the core cylinder 1232 and out of the unlock grooves 1224 or the lock grooves 1225, permitting free rotation of the core assembly 1230 relative to the sleeve 1220. The grooves are positioned such that the tumblers 1234 engage the unlock grooves 1224 when the door locking assembly 1200 is in the unlocked configuration and the tumblers 1234 engage the lock grooves 1225 when the door locking assembly 1200 is in the locked configuration.

The key aperture 1204 extends at least partially through the core cylinder 1232 such that the key 1202 can be inserted into the core cylinder 1232. When the key 1202 is inserted into the key aperture 1204, a surface, shown as profile 1236, of the key 1202 engages the tumblers 1234, causing the tumblers 1234 to move relative to the core cylinder 1232. The tumblers 1234 vary in size such that the amount of movement required to move the tumblers 1234 to a position flush to the outer surface of the core cylinder 1232 varies between each tumbler 1234. Accordingly, the tumblers 1234 and the profile 1236 are correspondingly shaped and sized such that the tumblers 1234 move to their respective retracted positions when the key 1202 is fully inserted. In some embodiments, the tumblers 1234 are biased radially outward (e.g., by one or more springs) to extend radially beyond the circumference of the core cylinder 1232. This biasing force biases the tumblers 1234 into engagement with the unlock grooves 1224 of the sleeve 1220.

Referring to FIGS. 63 and 72-75, the door locking assembly 1200 further includes a pair of keys, shear members, or plates, shown as retaining pins 1240. The retaining pins 1240 engage the lock body 1210 and the sleeve 1220 to limit (e.g., prevent) rotation of the sleeve 1220 relative to the lock body 1210. The retaining pins 1240 each include a first portion or section, shown as outer portion 1242, and a second portion or section, shown as inner portion 1244. The outer portion 1242 is located in (e.g., extends into) a corresponding retaining pin aperture 1216 of the lock body 1210, and the inner portion 1244 is located in (e.g., extends into) a corresponding retaining pin aperture 1223. As shown in FIGS. 73 and 74, the outer portion 1242 has a height H_1 defined in a radial direction relative to the longitudinal axis 1206, and the inner portion 1244 has a height H_2 defined parallel to the height H_1 . As shown, the height H_1 and the height H_2 are approximately equal. The outer portion 1242 has a width W_1 defined perpendicular to the longitudinal axis 1206 and the height, and the inner portion 1244 has a width W_2 defined parallel to the width W_1 . As shown, the width W_1 is larger than the width W_2 such that the retaining pin 1240 has a symmetrical T shape. Due to this shape, the retaining pins 1240 may be inserted in a radially inward direction from outside of the lock body 1210, as shown in FIG. 72. The outer portion 1242 and the inner portion 1244 have equal thicknesses T defined parallel to the longitudinal axis 1206.

Referring to FIGS. 59, 61, 62, and 68, the door locking assembly 1200 further includes a lever or interface member, shown as actuator arm 1250. The actuator arm 1250 is coupled to the core cylinder 1232 and positioned opposite the key aperture 1204. Specifically, a spacer, shown as hub 1252, rotationally couples the actuator arm 1250 to the core cylinder 1232 such that the actuator arm 1250 rotates with

the core cylinder 1232 when the key 1202 is fully inserted. The hub 1252 extends longitudinally between the actuator arm 1250 and the sleeve 1220. The hub 1252 is substantially centered about the longitudinal axis 1206, and the core cylinder 1232 extends longitudinally through the hub 1252 (e.g., through an aperture defined by the hub 1252). The hub 1252 is rotationally coupled to the core cylinder 1232 (e.g., by a key, splined engagement, setscrew, pin, etc.) such that rotation of the hub 1252 relative to the core cylinder 1232 is limited (e.g., prevented). The hub 1252 is rotationally coupled to the actuator arm 1250 (e.g., one or more protrusions of the hub 1252 extend into corresponding apertures of the actuator arm 1250). A retaining clip, shown as snap ring 1254, limits longitudinal movement of the actuator arm 1250 and the hub 1252 away from the sleeve 1220. A protrusion, shown as spring bar 1256, is fixedly coupled to the hub 1252. The spring bar 1256 is offset from the longitudinal axis 1206 and extends longitudinally rearward from the hub 1252.

Referring to FIGS. 58-60, the side door assembly 700 includes the opening mechanism 748 including the handle assembly 750. The handle assembly 750 is coupled to the driver cab door 800 and includes an interior handle and the exterior handle 756. The opening mechanism 748 includes various door closure components (e.g., latches, levers, etc.) that releasably secure the driver cab door 800 in the closed position when the opening mechanism 748 is in an engaged configuration (as described above). When the interior handle or the exterior handle 756 are operated by a user, the opening mechanism 748 changes to a disengaged configuration, permitting movement of the driver cab door 800 out of the closed position. The door locking assembly 1200 engages with the opening mechanism 748 such that the door locking assembly 1200 (a) prevents the opening mechanism 748 from changing to the disengaged configuration when the door locking assembly 1200 is in the locked configuration and (b) permits the opening mechanism 748 to change to the disengaged configuration when the door locking assembly 1200 is in the unlocked configuration. Specifically, as shown in FIG. 61, a coupler or interface, shown as clip 1258, couples the actuator arm 1250 to the opening mechanism 748. The clip 1258 is radially offset from the longitudinal axis 1206 such that the clip 1258 translates in an arc around the longitudinal axis 1206 as the key 1202 rotates the core assembly 1230 and the door locking assembly 1200 moves between the locked and unlocked configurations. The clip 1258 may be coupled to a lever, rod, or another component of the opening mechanism 748 (e.g., the locking latch 768, etc.).

Referring to FIGS. 61, 76, and 77, the door locking assembly 1200 further includes a biasing member (e.g., a torsion spring), shown as centering spring 1260. The centering spring 1260 includes a coil portion 1262 that is wrapped around the hub 1252. A first end and a second end of the centering spring 1260 include protrusions, shown as tang 1264 and tang 1266 respectively, that extend radially outward from the coil portion 1262. The tang 1264 and the tang 1266 extend on opposite sides of the spring bar 1218 and the spring bar 1256. When the hub 1252 is in a centered orientation (e.g., as shown in FIG. 76) relative to the lock body 1210, the spring bar 1218 and the spring bar 1256 align with one another. When the hub 1252 is rotated, the spring bar 1218 and the spring bar 1256 are moved out of alignment, forcing the tang 1266 apart from the tang 1264. This causes the centering spring 1260 to impart a biasing force on the spring bar 1218 and the spring bar 1256, biasing the hub 1252 back into the centered orientation. In some embodi-

ments, the centered orientation corresponds to the unlocked configuration of the door locking assembly 1200. In other embodiments, the centered orientation corresponds to the locked configuration of the door locking assembly 1200.

Referring to FIGS. 61-69 and 78, the door locking assembly 1200 further includes a mounting assembly, shown as front mount 1270, that couples the door locking assembly 1200 to the body 100. The front mount 1270 includes a main body, shown as mounting plate 1272, that is coupled to the lock body 1210. Positioned rearward of the mounting plate 1272 is a seal, shown as face seal 1274. In some embodiments, such as the embodiment shown in FIG. 68, the body 100 extends between the face seal 1274 and the mounting protrusions 1212 to couple the lock body 1210 to the body 100. The face seal 1274 may form a watertight seal between the door locking assembly 1200 and the body 100 to prevent ingress of water into the delivery vehicle 10. Positioned on the exterior of the mounting plate 1272 and coupled to the mounting plate 1272 is a cover, shown as faceplate 1276. The faceplate 1276 at least partially surrounds the key aperture 1204. The faceplate 1276 covers the mounting plate 1272. In the embodiment shown, the exterior of the faceplate 1276 includes a domed surface that surrounds the key aperture 1204.

Referring to FIGS. 7 and 78-81, the door locking assembly 1200 is shown coupled to the body 100 of the delivery vehicle 10. In these embodiments, the door locking assembly 1200 is positioned within a recess 1280 that is inset from an outer surface 1282 of the body 100. Specifically, the door locking assembly 1200 is positioned within the recess 1280 such that the key aperture 1204 is positioned within the recess 1280. In such an embodiment, the key 1202 must be inserted into the recess 1280 to reach the key aperture 1204.

As shown, the recess 1280 is defined by a body panel 1281 of the body 100 that is positioned forward of the driver cab door 800. In other embodiments, the recess 1280 is defined by another part of the body 100. The body 100 includes a substantially flat face, shown as base portion 1284, and one or more tapered (e.g., curved, angled, etc.) faces, shown as inclined portions 1286, that extend between the outer surface 1282 and the base portion 1284. In other embodiments, the inclined portions 1286 are substantially perpendicular to the base portion 1284 and/or the outer surface 1282. The outer surface 1282, the base portion 1284, and the inclined portions 1286 may be formed from a single, continuous piece of material (e.g., sheet metal). The base portion 1284 defines an aperture that receives the door locking assembly 1200 therethrough. As shown in FIG. 78, the base portion 1284 extends between the mounting plate 1272 and the mounting protrusions 1212.

Referring to FIGS. 79-81, the recess 1280 may have a variety of different shapes. In FIG. 79, the recess 1280 extends horizontally along the surface of the body 100, from one edge of the body panel 1281 to an opposing edge of the body panel 1281. In FIG. 80, the recess 1280 is formed as a circle surrounding the door locking assembly 1200 and does not extend to an edge of the body panel 1281. In FIG. 81, the recess 1280 is curved and extends forward from a rear edge of the body panel 1281, but does not extend to any other edge of the body panel 1281. In other embodiments, the recess 1280 is otherwise positioned on the delivery vehicle 10. By way of example, the recess 1280 may be partially or entirely defined by the driver cab door 800, the side cargo door 1000, or another door of the delivery vehicle 10. Accordingly, the door locking assembly 1200 may be coupled to the driver cab door 800, the side cargo door, or another door of the delivery vehicle 10.

During operation of the door locking assembly 1200, a user may insert the key 1202 into the key aperture 1204 and rotate the key 1202 to reconfigure the door locking assembly 1200 between the locked configuration and the unlocked configuration. When the key 1202 is fully inserted, the tumblers 1234 are moved into the retracted position, and the core assembly 1230 is permitted to rotate freely apart from the biasing force of the 1260. When the user has rotated the key 1202 sufficiently to reconfigure the door locking assembly 1200, the key 1202 may be removed, permitting the tumblers 1234 to enter the unlock grooves 1224 or the lock grooves 1225. When the key 1202 is removed, the tumblers 1234 engage the unlock groove 1224 or the lock groove 1225 to limit rotation of the core assembly 1230 relative to the sleeve 1220. The retaining pins 1240 limit rotation of the sleeve 1220 relative to the lock body 1210, which is fixed to the body 100 of the delivery vehicle 10. Accordingly, a user is prevented from moving the door locking assembly 1200 out of the locked configuration without the use of the key 1202, thereby preventing unauthorized access to the interior of the delivery vehicle 10.

Referring to FIGS. 61-65, 73, and 74, a user may attempt to obtain unauthorized access to the interior of the delivery vehicle 10 by forcing the door locking assembly 1200 open.

In one instance, the user may attempt to force the door locking assembly 1200 open by inserting a torque transmission device, such as a screwdriver, into the key aperture 1204 and applying a torque to the core assembly 1230 in an attempt to force the core assembly 1230 to rotate toward the unlocked configuration. This applied torque forces the tumblers 1234 against the sleeve 1220, which in turn applies a torque to the sleeve 1220. The retaining pins 1240 resist rotation of the sleeve 1220. The retaining pins 1240 may be configured (e.g., sized, made from specific materials) such that the retaining pins 1240 fail at a lesser applied torque than the tumblers 1234. Such an arrangement may permit replacement of the retaining pins 1240 instead of the core assembly 1230 when the door locking assembly 1200 is forcibly entered. This may be desirable, as the retaining pins 1240 may be easier and/or more cost effective to replace than the core assembly 1230.

When the retaining pins 1240 fail during a forced access attempt, the T-shaped geometry of the retaining pins 1240 may cause the outer portion 1242 to shear off of the inner portion 1244 along a line extending between the outer portion 1242 and the inner portion 1244. To improve the resistance of the door locking assembly 1200 to forced entry, the retaining pins 1240 may be made from a relatively hard material, such as hardened steel. The retaining pins 1240 may be shaped and/or sized such that after failure (e.g., shearing of the retaining pins 1240 due to an applied torque), the retaining pins 1240 prevent the door locking assembly 1200 from changing to the unlocked configuration, even if the key 1202 is used, until the door locking assembly 1200 is disassembled and the retaining pins 1240 are replaced.

Referring to FIGS. 77 and 78, a user may alternatively attempt to obtain unauthorized access to the interior of the delivery vehicle 10 by using a tool (e.g., a pair of pliers, a wrench, etc.) to engage (e.g., grasp, grab, press against, etc.) an exterior surface of the door locking assembly 1200 and apply a torque to force the core assembly 1230 to rotate. To prevent this engagement and thereby thwart this method of forced access, the door locking assembly 1200 is positioned within the recess 1280. In order for a user to engage a tool with the door locking assembly 1200, they must extend the tool into the recess 1280, limiting the types of tool that can be used and the orientations in which a tool can reach the

door locking assembly 1200. This prevents the user from using tools in certain orientations in which the tool can securely engage the door locking assembly 1200 and/or provide a user with a maximum amount of leverage. The door locking assembly 1200 is positioned in close proximity to the inclined portions 1286 of the recess 1280, limiting the space around the door locking assembly 1200 in which a tool can maneuver. Additionally, the outer surface of the faceplate 1276 is dome-shaped such that the surface thereof prevents effective engagement with most tools (e.g., tools are incapable of applying sufficient frictional force, grip, or traction to cause movement of the faceplate 1276).

As utilized herein, the terms “approximately,” “about,” “substantially,” and similar terms are intended to have a broad meaning in harmony with the common and accepted usage by those of ordinary skill in the art to which the subject matter of this disclosure pertains. It should be understood by those of skill in the art who review this disclosure that these terms are intended to allow a description of certain features described and claimed without restricting the scope of these features to the precise numerical ranges provided. Accordingly, these terms should be interpreted as indicating that insubstantial or inconsequential modifications or alterations of the subject matter described and claimed are considered to be within the scope of the disclosure as recited in the appended claims.

It should be noted that the term “exemplary” and variations thereof, as used herein to describe various embodiments, are intended to indicate that such embodiments are possible examples, representations, or illustrations of possible embodiments (and such terms are not intended to connote that such embodiments are necessarily extraordinary or superlative examples).

The term “coupled” and variations thereof, as used herein, means the joining of two members directly or indirectly to one another. Such joining may be stationary (e.g., permanent or fixed) or moveable (e.g., removable or releasable). Such joining may be achieved with the two members coupled directly to each other, with the two members coupled to each other using a separate intervening member and any additional intermediate members coupled with one another, or with the two members coupled to each other using an intervening member that is integrally formed as a single unitary body with one of the two members. If “coupled” or variations thereof are modified by an additional term (e.g., directly coupled), the generic definition of “coupled” provided above is modified by the plain language meaning of the additional term (e.g., “directly coupled” means the joining of two members without any separate intervening member), resulting in a narrower definition than the generic definition of “coupled” provided above. Such coupling may be mechanical, electrical, or fluidic.

References herein to the positions of elements (e.g., “top,” “bottom,” “above,” “below”) are merely used to describe the orientation of various elements in the figures. It should be noted that the orientation of various elements may differ according to other exemplary embodiments, and that such variations are intended to be encompassed by the present disclosure.

Although the figures and description may illustrate a specific order of method steps, the order of such steps may differ from what is depicted and described, unless specified differently above. Also, two or more steps may be performed concurrently or with partial concurrence, unless specified differently above. Such variation may depend, for example, on the software and hardware systems chosen and on designer choice. All such variations are within the scope of

the disclosure. Likewise, software implementations of the described methods could be accomplished with standard programming techniques with rule-based logic and other logic to accomplish the various connection steps, processing steps, comparison steps, and decision steps.

It is important to note that the construction and arrangement of the delivery vehicle 10 and the systems and components thereof as shown in the various exemplary embodiments is illustrative only. Additionally, any element disclosed in one embodiment may be incorporated or utilized with any other embodiment disclosed herein.

The invention claimed is:

1. A vehicle assembly comprising:

a vehicle body defining a driver compartment having a first door with a first window and a second door with a second window; and

a driver seat disposed within the driver compartment; wherein, when the driver seat is in a position that accommodates an operator being in a 95th male height percentile, the operator within the driver seat can see out of (i) the first window at a first angle relative to a forward looking direction that is parallel with a longitudinal axis of the vehicle body and (ii) the second window at a second angle relative to the forward looking direction; and

wherein each of the first angle and the second angle is at least 95 degrees.

2. The vehicle assembly of claim 1, further comprising: a chassis defining a prime mover compartment at a front end thereof; and

a prime mover coupled to the chassis within the prime mover compartment.

3. The vehicle assembly of claim 2, wherein the prime mover is transversely mounted within the prime mover compartment.

4. The vehicle assembly of claim 2, further comprising a firewall positioned at a rear of the prime mover compartment that separates the driver compartment from the prime mover compartment, and wherein the firewall is substantially flat and substantially vertically oriented.

5. The vehicle assembly of claim 1, wherein the vehicle body defines a cargo compartment, further comprising a partition positioned to at least partially separate the driver compartment from the cargo compartment.

6. The vehicle assembly of claim 1, further comprising A-pillars positioned at a front end of the driver compartment, a length of the A-pillars being a least one meter.

7. The vehicle assembly of claim 6, wherein at least one of:

(a) the A-pillars have an overlapping construction including an inner portion and an outer portion overlapping the inner portion; or

(b) the length of the A-pillars is at least 1.10 meters.

8. The vehicle assembly of claim 1, further comprising a steering column positioned within the driver compartment, wherein the driver seat and the steering column are centered about a central seating plane, wherein the central seating plane is positioned a distance from a side of the driver compartment, and wherein the distance is less than 25% of a total width of the driver compartment.

9. The vehicle assembly of claim 1, wherein the first door has a first height of at least 1.6 meters, and wherein the first window has a second height that is at least 50% of the first height.

10. The vehicle assembly of claim 9, wherein the second height is at least 60% of the first height.

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11. The vehicle assembly of claim 1, wherein, when the driver seat is in the position that accommodates the operator being in the 95th male height percentile, the driver seat is positioned a distance of at least four inches forward of a rear edge of the first window.

12. The vehicle assembly of claim 1, wherein each of the first angle and the second angle is at least 100 degrees.

13. The vehicle assembly of claim 1, wherein the first angle is at least 110 degrees.

14. A vehicle assembly comprising:

a vehicle body defining a driver compartment and a cargo compartment positioned rearward of the driver compartment, the driver compartment having a door with a window, the vehicle body having A-pillars positioned at a front end of the driver compartment;

wherein at least one of:

- (a) the A-pillars have a length of at least one meter; or
- (b) the door has a first height of at least 1.6 meters and the window has a second height that is at least 60% of the first height.

15. The vehicle assembly of claim 14, wherein the length of the A-pillars is at least one meter.

16. The vehicle assembly of claim 14, wherein the door has the first height of at least 1.6 meters and the window has the second height that is at least 60% of the first height.

17. The vehicle assembly of claim 14, further comprising a driver seat positioned within the driver compartment, wherein, when the driver seat is in a position that accommodates an operator being in a 95th male height percentile, the operator within the driver seat can see out of the window at an angle of at least 95 degrees relative to a forward looking direction that is parallel with a longitudinal axis of the vehicle body.

18. The vehicle assembly of claim 14, further comprising a steering column and a driver seat positioned within the

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driver compartment, wherein the driver seat and the steering column are centered about a central seating plane, wherein the central seating plane is positioned a distance from a side of the driver compartment, and wherein the distance is less than 25% of a total width of the driver compartment.

19. A vehicle assembly comprising:

a vehicle body defining a driver compartment having a door with a window, the vehicle body having A-pillars positioned at a front end of the driver compartment; wherein at least one of:

- (a) the door has a first height of at least 1.6 meters and the window has a second height that is at least 60% of the first height;
- (b) the A-pillars have a length of at least 1.10 meters; or
- (c) when a driver seat is in a position within the vehicle body that accommodates an operator being in a 95th male height percentile, the operator within the driver seat can see out of the window at an angle of at least 100 degrees relative to a forward looking direction that is parallel with a longitudinal axis of the vehicle body.

20. The vehicle assembly of claim 19, wherein at least two of:

- (a) the first height is at least 1.6 meters and the second height is at least 60% of the first height;
- (b) the length is at least 1.10 meters; or
- (c) when the driver seat is in the position within the vehicle body that accommodates the operator being in the 95th male height percentile, the operator within the driver seat can see out of the window at the angle of at least 100 degrees relative to the forward looking direction.

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